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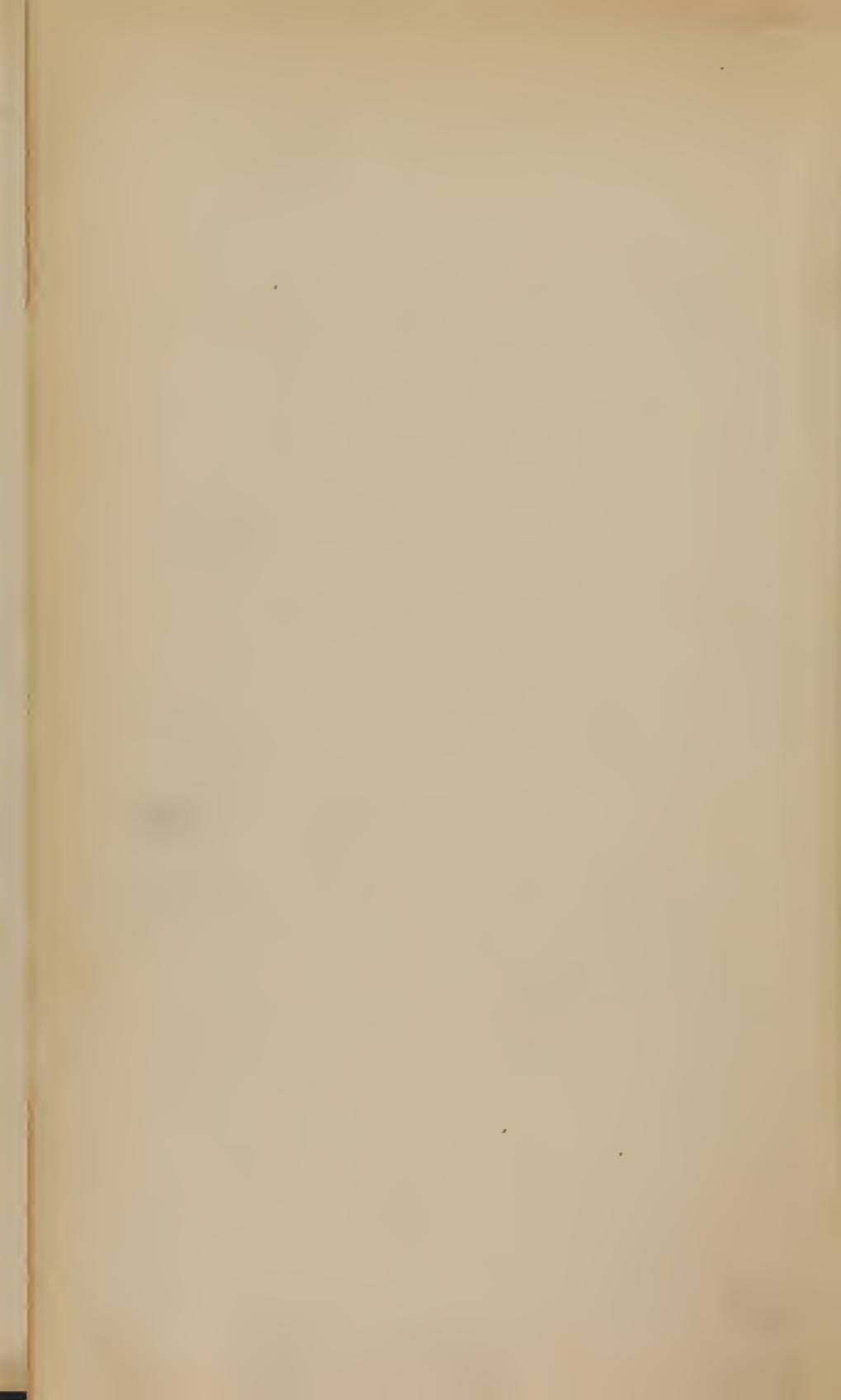
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**ANNEX**

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Brig. Gen. G. H. Greene  
With the kind regards of the Writer  
**INTRAMURAL**

# Interments in Populous Cities,

AND THEIR INFLUENCE UPON

HEALTH AND EPIDEMICS.

BY JOHN H. RAUCH, M. D.

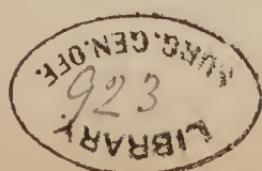
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## P R E F A C E .

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IT is but justice to the writer, to state that this paper was prepared in the fall of 1859, and that its publication at that time was delayed by circumstances beyond his control, and by his subsequent absence for several years. Upon his recent return, and resumption of his residence in Chicago, it was suggested by friends who knew of the existence of the manuscript, and are familiar with its contents, that its publication at this time might be of service to the community. In compliance with this suggestion, it is now submitted after careful review, with the addition of a few notes, and facts that have transpired in connection with its application to this city, in view of the great increase in population during his absence, and the probable occurrence of epidemic cholera within a limited period. No special claim is made to originality, and little speculation is indulged in, but the paper is presented rather as a review of historical and scientific facts, which have been collated from those sources to which he had access at the time, with the occasional introduction of facts that have fallen under his own observation, or have been communicated to him by scientific friends. It was written without reference to any special epidemic, the principles and application of the laws of ~~hygiene~~ being the same in all. Many of the facts are so strikingly applicable to the peculiar circumstances under which Chicago is placed at this time, with regard to its topography, drainage, supply of water, and its cemeteries, that being fully impressed with

the importance of their early and general dissemination, he is constrained to give these facts and principles to the public in a manner not wholly satisfactory to himself, fully believing, that if intelligently applied, much of the impending danger may thereby be averted, if not entirely prevented.

CHICAGO, March 5, 1866.

## INTRAMURAL INTERMENTS.

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To appreciate the objects of the following paper, it is necessary to take a brief preliminary review of history, both ancient and modern, so far as it relates to the various modes of disposing of the dead. The divers modes which have prevailed at different periods of the world's history, with but few exceptions, have had their origin either in peculiar forms of religion or of government, as modified by civilization and the progress of sanitary science. It has been the object of the writer, in the investigation of this subject, to ascertain and it is his intention to trace, the origin of the custom of interments in cities, and the various legal enactments that have been made from time to time forbidding what was then presumed, and is now acknowledged to be, a violation of the true principles of hygiene.

It was Cicero's opinion, and the records of history undoubtedly corroborate it, that inhumation, or burying in the ground, was the oldest mode of sepulture. Cremation, or the reduction to ashes of the dead, is of ancient origin, but was never generally adopted until national animosities gave rise to inhuman treatment of the dead. This was particularly the case with the Romans, and was adopted by them in consequence of the impossibility of interring human remains left exposed during the wars of the Republic, and the want

of respect shown the dead by the barbarian hordes of the North. The practice may also have arisen from the well known influence of decomposing animal matter upon health; and that burning was the easiest, most expeditious and effective remedy.

Mankind have concurred by common consent in the propriety and decency of interments, as well as its suitableness for the general health and comfort of the living. It is an act prompted by humanity, and considered a natural tribute of respect from the living to the dead; a custom which has been continually observed with religious ceremonies, by enemies in time of war, and rarely denied in any country, except to those who have violated the laws of God and man.

The burial of the dead has always been considered a religious duty, and instances of its discharge constantly occur in both Scripture and profane history. Jeremiah threatens it as the greatest punishment, that the wicked should be deprived of burial and left on a dunghill; or, as it is more emphatically expressed, left to the "burial of an ass." The example of Tobit, who went about burying the dead bodies of his countrymen at the hazard of his own life, proves that good men considered it a part of their religious duties to bury the dead. Egypt, Greece, and Rome, always paid much respect to the dead, and regarded it as an object of the highest importance. From the writers of antiquity, we learn the practice of heathen nations, and the researches of the antiquaries of our own generation prove that both on the Eastern continent, and on our own, the high raised tumulus or mound continued to be a mark of respect among the living, and a signal honor to the dead, in every age of which we have any record.

Sepulchral monuments are found in every part of the world; of these, mounds are the most ancient, and

their contents are as various as the people who have occupied the globe, or the different circumstances by which they have been distinguished. “The pyramids of Egypt are but sepulchral mounds of a more solid material and stupendous size; and the church-yard hillock of the present day is but a relic of their universal prevalence.”

Among so many customs—the result of necessity, caprice, or the love of change under different circumstances—the instinctive sense of man, his religious doctrines, and his laws, all have agreed in removing the dead from the living.

Among the Egyptians, the body having been embalmed by persons legally appointed to the exercise of the profession, was returned to the relations, who enclosed it in a case of wood made to resemble a human figure, and placed it against the wall in the repository of their dead. Contagious diseases breaking out after this practice had been continued for some time, and baffling all remedies, they were led to remove all the embalmed to a distance; and hence we have the origin of the catacombs and pyramids. Gliddon says, “that before this period the Necropoli were situated from ten to fifteen miles from the cities or towns.” After the entrance of the Jews into the Promised Land, with the establishment of the Judaic law, and the inauguration of their religious ceremonies, they found that the commands of God forbade them to allow the dangerous vicinage of the dead. According to these laws, those who touched a corpse contracted a legal impurity, to efface which their clothes must undergo the cleansing of water. If the dead were buried in their houses, it rendered the latter unclean. This rule made them attentive to the removal of the dead from their dwellings, and caves and fields were appropriated for interment.

These customs were still in force among the Jews at the crucifixion of our Saviour, as tombs hewn out of the rock in gardens (enclosed fields or lots,) out of the city were made use of as places of sepulture; also, that individuals had tombs of their own, and that our Saviour was buried in one of these, on or near Mt. Calvary, where he was crucified, is proven by the following verses:

“ And when Joseph had taken the body, he wrapped it in a clean linen cloth, and laid it in his own new tomb, which he had hewn out in the rock; and he rolled a great stone to the door of the sepulchre, and departed.”

“ Then took they the body of Jesus, and wound it in linen clothes with the spices, as the manner of the Jews is to bury. Now in the place where he was crucified there was a garden; and in the garden a new sepulchre, wherein was never man yet laid. There laid they Jesus therefore because of the Jews’ preparation day, for the sepulchre was nigh at hand.”

In Greece, the dead were always buried beyond the limits of cities, and only in rare cases were they permitted to remain within. The whole religious doctrines and mythology of the Grecians tended to support the laws that removed the bodies of the dead completely from the habitations of the living. This was particularly the case with the Athenians, the Smyrnæans, the Sicyonians, the Corinthians, and the Syracusans. The Lacedemonians, however, buried within the limits of habitation. It had been an idea universally prevalent that the touch of the dead body conveyed pollution; and Lycurgus, the legislator of Sparta, was ambitious to remove the prejudice. He not only introduced the custom of burial within the city, but erected monuments near the temple, that the youth might be trained from their infancy to the familiar view of such objects, and be unappalled at the spectacle of death, and to ex-

cite them to emulate the deeds of those whom the State had decreed illustrious.

Experience had taught the Romans that they could not, with safety to the living, indulge in the interment of the dead among themselves and their dwellings. This, with their religious sentiments, caused them to remove the places of burial some distance from the city. It was a special privilege granted by the Senate to particular persons, that they be buried within the walls. The examples of Numa and Servius Tullus prove that they regarded the practice as injurious—they directly requesting to be buried without the city. Inhumation and cremation were alike practiced at this time by the Romans. Many of the remains of ancient Rome, now to be seen, were reared as memorials of respect and as religious observances for the dead, and attest their desire for the promotion of the public health.

The customs and usages of the Romans in relation to the modes of burial, with few exceptions, continued in force until the reign of the Cæsars; and it is evident that Rome, at that time, was better protected against the occurrence of epidemics than many cities of modern times.

Many of the Greeks and Romans had an idea that their souls could not be admitted into the Elysian Fields until their bodies were committed to the earth. Cremation and simple interment were also Druidical and ancient British forms. Woden enacted laws for burying the dead. Property was buried with the dead, from the persuasion that the soul was immortal and would stand in need of these things in the other life. Such is also the custom and belief of many of the Indian tribes of this country.

The introduction of Christianity made a great alteration in the modes of disposing of the dead. Cremation

tion ceased ; and the believing Romans betook themselves to the use of sarcophagi, a sort of stone-tomb or coffin. The Romanized and converted Britons would naturally do the same ; and the Saxons, as the successors of the Britons, inclined from the first to adopt their practices. After the arrival of St. Austin in Great Britain, A. D. 596, and the consequent conversion of the natives, the use of coffins, as well as the mode of placing the body facing to the East, was universally introduced. Among the primitive Christians, burying in cities was not allowed for the first 300 years, nor in churches for many ages after ; the dead bodies being first deposited in the atrium or church-yard, and porches and porticos of the church.

On the introduction of Christianity, a regular form of disposing of the dead took place. The altar in the first Christian Churches was placed in the East, under a window, to receive the first rays of light, as typical of the Star in the East which dawned over the place of the Saviour's birth, and also of his second coming "to be the Judge of quick and dead." The people, for greater regularity in worship, were taught to look towards the altar ; the dead, for a similar reason, were buried with their faces the same way, with the exception of the priests, who were buried to face the congregation. The reason alleged by Gregory the Great, for burying in churches, or in places adjoining them, was that their relatives and friends, remembering those whose sepulchres they beheld, might thereby be led to offer up prayers for their souls. Hence, too, that striking and solemn address, which marked the epitaphs of the monkish ages, "*Orate pro animam, miserrimi peccatoris,*" — "Pray for the soul of a most miserable sinner." Gregory's reason was afterward incorporated in the canon law.

This custom was carried into England by Cuthbert, Archbishop of Canterbury, about the year 750; and the practice of erecting vaults in churches and under the altars, was begun by Lanfranc, Archbishop of Canterbury, when he rebuilt the cathedral there, about 1075.

From this time, it seems to have been left to the control of the bishop. Says a French writer:

“Contrary to the spirit of religion and the general usage of the Christian Church during the first five centuries, the priests arrogated to themselves the right of being buried in the churches, and claimed this as one of their special privileges. This claim was admitted by several councils, contested by others, attacked and defended by various writers, and was at length almost everywhere respected in Europe. The pious individual who had erected a chapel, was permitted to be buried in the holy place; the choir was destined to receive the bodies of the priests, and the monks were deposited under the immense galleries of their convents.”

The desire to retain the dead in cities, seems to have increased by impediments, and it became regarded as an enviable privilege to be allowed to occupy after death the places where holy persons had been in the habit of offering their prayers to Heaven. This feeling was soon carried so far as to cause them to believe that the emanations from the bodies of saints had power to warm the hearts of the devout, and to communicate impressions favorable to fervor and piety.

In the Roman law of the Twelve Tables, enacted by the Decemviri about the beginning of the fourth century, the VII expressly forbids the burial or burning of the dead within the city, and continued to be incorporated into the laws of the succeeding forms of government for many years. The prohibition after Constantine, was explicitly laid down in the Code of Theodosius, A. D. 381; and the admission into churches of the bodies of even holy personages was pointedly forbidden,

and was renewed in the Justinian Code. Up to the sixth century, the Senate of Rome had not permitted any cemetery in or near the city, but in 509, Pope Marcellus obtained from the Senate permission to found the first Christian cemetery at Rome. The Capitularies, or civil and religious statutes of Charlemagne, enacted about the eighth century, forbade the interment in churches, and continued in force until 1057, when a mausoleum was erected to Regnault I, Count of Burgundy, in the portico of the church of St. Stephen, at Bensaçon. In 1102, the body of Eudes I, Duke of Burgundy, was deposited under the arch of entrance to the Abbey of Citeaux, which he founded. The discipline of the church became relaxed, "through the interested motives of those who had the power to retail false honors to princes and pontiffs, to pretended saints, and also to great sinners, who were encouraged in their wickedness by the hope of resting their bones in holy earth," though continual efforts were made by the decrees of more than twenty councils, convened at different periods from the eighth to the eighteenth century, to restore it to its pristine integrity.

From the foregoing, we may safely ascribe the origin of church-yards, and the practice of burying the dead in them, to superstition and the profit arising from it. Though gradual in its growth, in the course of time it became universal throughout Christendom, and continued so until its deleterious influence upon the health of communities became so patent that laws were enacted in different countries to suppress it.

The Parliament of Paris, in 1765, took a decisive stand against the abuses of interment. A decree was passed, the occasion of which was the almost universal complaint from inhabitants of parishes of the noisome

and sickly influence of churches and cemeteries. The preamble recites :

" That daily complaints are made of the infectious effect of parish cemeteries, especially when the heats of summer have increased the exhalations ; then the air is so corrupted that the most necessary aliments will only keep a few hours in the neighboring houses ; this proceeds, either from the soil being so completely saturated that it cannot retain or absorb any longer the putrescent dissolution, or from too circumscribed extent of the ground for the number of the dead annually interred."

The articles provided for the closing of all church-yards and cemeteries in Paris, for five years, and for establishing cemeteries out of the city. This did not suffice ; the same authority, in Sept., 1774, was obliged to make another decree against opening vaults for the admission of bodies. This decree says, that—

" As the decrees of the court relating to burial in churches, contain the motives which led to these decrees, it would be useless to repeat them ; while reasons still more pressing, daily call for a strict attention to the re-opening of vaults, the fatal consequences of which demand a general law to be put in force against all interment in churches whatever. This abuse, introduced by pride and vanity, is now often laid aside by Christian humility, and the noblest have requested to be interred in cemeteries. This court will reinstate the ancient discipline of the church, and give a new sanction to the rescripts of those sovereigns who maintained it by their authority ; the temples will then resume the decency and order of appearance which they cannot display while the opening of vaults is permitted ; they will also be freed from fetid smells, which render the air in them insalubrious, and which are perhaps the principal cause of the distressing epidemics that have appeared in the provinces. The general complaint against the practice of church vaults is the strongest argument in favor of this decree. Medical men assure us that the vapors exhaling from putrefaction, fill the air with chemical compounds dangerous to health and productive of malignant diseases. The epidemics which prevail in the warm season confirm their assertion. We know, however, that this decree is against the wishes of a certain class, who found their claims upon a possession, in itself an

abuse, or upon titles yielded through complaisance, or obtained without any legitimate grant, or upon a permission acquired by means of a small sum, which, they imagine, entails an hereditary right to burial within a church; as if possession were a right superior to justice, or that a prescriptive indulgence should be continued, in despite of its injury to the public good; or that a certain sum of money were equivalent for the health and life of their fellow citizens. But these objections are of little moment, and must yield to considerations of the public weal; and, no doubt, those very individuals, if they can cast aside their erroneous prejudices and prepossessions, and look only to the advantage of their fellow-citizens, will join with the majority in applauding this decree. It is, moreover, an acceptable service in those entrusted with the power of watching over the welfare of their fellow citizens, to extend their solicitude to the preservation of the public health, by using the most efficacious means for removing the causes of disease. This object alone, independent of any other, would have been sufficient to determine this court to institute this decree."

Louis XV concurred entirely in the prohibition of city graveyards by the Parliament of Paris, and granted to the parish of St. Louis, at Versailles, 160 perches of land (36,000 square feet) in the forest of Satori, to be used as a cemetery in place of the old one. In March, 1776, a royal declaration was made, the preamble of which sets forth, that—

"The archbishop, bishops, and other ecclesiastics, in council assembled last year in our good city of Paris, have represented to Us that, for many years complaints have been made to them from different parts of their respective dioceses of frequent inhumations in churches, and also on the actual situation of their cemeteries, which are too near the said churches, and might be placed more advantageously, if removed to a distance from cities, towns and villages, in the several provinces of our kingdom: We have given to these representations more attention, because informed that our magistrates are convinced of the necessity of a reform in this part of the public police, and have long desired suitable laws in union with the rules of the church, to provide for the purity of the air, without infringing, if possible, upon the rights of archbishops, bishops, curates, patrons, lords, founders, etc., in the churches of our kingdom: these wishes having

reached Us, We think it unnecessary to defer any longer making known our intentions, and We are persuaded that our subjects will receive with gratitude a regulation dictated by our zeal for their preservation."

The articles which follow prohibit graveyards in cities or towns; and they permit no interment in churches, chapels or cloisters, with but few exceptions; and ordain, besides, that even those shall not be interred except under vaults covering a space of 72 square feet, built of stone and flagged; the bodies to be placed six feet deep in the earth, under the lower pavement of the vault; they also invest municipal corporations with the right to obtain and hold in fee simple any grounds for new cemeteries.

In the year 1777, Mons. Lenoir, Minister of Police, even after interments had ceased, devised the entire abolition of the Cemetery of the Innocents, by cleaning out its charnels and pits, and removing the remains to the quarries or catacombs, which had been worked from time immemorial, under the southern part of the city. This required ten years for its completion. It may be remarked, that King John, so early as 1350, established the first sanitary police in France. The first permanent "Conseil de Salubrite," or Council of Health, was established on the 6th of July, 1802, and was modified by new decrees in 1810 and in 1815. It was composed of some of the most distinguished men of the nation, who reported annually. The cemeteries were under their special care. Councils of Health, similar to that of Paris, were established in Nantes, in 1817; in Bordeaux soon after; in Lyons, in 1822; in Marseilles, in 1825; in Lisle, in 1828, and in Rouen, in 1831. In 1848, an ordinance was passed by the "Conseil d'Etat," for a general health regulation throughout the French Republic.

To pass from France to Germany—during the reign of Maria Theresa (about 1730), interments in the city of Vienna were forbidden. In the various German and Prussian States, systems of sanitary and medical police now exist in greater perfection, and have been applied more extensively to society than in any other country. Particular attention has been paid to intramural interments; and, in nearly all the cities, the dead are buried without the walls. Among the regulations adopted at Munich and Frankfort, in 1829, were these: that all interments within the municipal limits be abolished, and that no grave is to be re-opened within less than twenty years; and that all graves must be seven feet long, three and a half feet wide and five feet deep for adults, with a foot space between them.

Great Britain has been behind the Continental States in its attention to the sanitary laws of interments. In Ireland, during the summer of 1740, a pestilential fever raged in the city of Dublin, which was distinctly traced by the authorities to the exhalations from church-yards. So immediate and satisfactory was the conviction of its necessity, that the graveyards, by authority, were ordered to be removed out of the city. The sanitary welfare and improvement of the people attracted little attention in Great Britain until within the last thirty years. From that time until the present, much attention has been paid to the subject. On March 8th, 1842, a select committee of fifteen was appointed to consider the expediency of framing some legislative enactment to remedy the evils arising from the interment of bodies within the precincts of large towns, or of places densely populated. The committee reported the June succeeding, under the title of “Report from the Select Committee on Improvement of the Health of Towns; and also Effect of Interments of Bodies in Towns.”

In 1843, appeared Mr. Chadwick's "Report on the Results of a Special Inquiry into the Practice of Interments;" and, as the result of the above reports, in 1848 was passed "An Act for promoting the Public Health;" and in 1850 another "Report on a General Scheme of Extramural Sepulture, by the General Board of Health," was presented to both houses of Parliament, by command of Her Majesty; and soon after was passed an Act for the abolition of interments in towns.

In the United States, the subject of interments has occupied the public attention, although to a limited extent, for more than fifty years. In 1806, the Board of Health of New York appointed Dr. Edward Miller, John Pintard, Esq., and Mr. Winant Van Zant, a committee to report on measures necessary to secure the health of the city of New York. The following is an extract from the report drawn up by Dr. Miller:

"The Committee of the Board of Health, etc., etc., Report, that interments of dead bodies within the city ought to be prohibited. A vast mass of decaying animal matter, produced by the superstition of interring dead bodies near the churches, and which has been accumulating for a long lapse of time, is now deposited in many of the most populous parts of the city. It is impossible that such a quantity of these animal remains, even if placed at the greatest depth of interment commonly practiced, can continue to be inoffensive and safe. It is difficult, if not impracticable, to determine to what distance around the matter extricated during the progress of putrefaction may spread; and, by pervading the ground, tainting the waters, and perhaps emitting noxious exhalations into the atmosphere, do great mischief. But if it should be decided still to persist in the practice of interments within the city, it ought to be judged necessary to order the envelopment of the bodies in some species of calcareous earth, either quick-lime or chalk. The present burial grounds might serve extremely well for plantations of grove and forest trees, and thereby, instead of remaining receptacles of putrefying matter and hot beds of miasmata, might be rendered useful and ornamental to the city. This growing evil must be corrected at some period; for it is increasing and extending by daily aggregation to a mass

already very large, and the sooner it is arrested the less violence will be done to the feelings and habits of our citizens."

This report was approved and sent with a memorial to the legislature, and was instrumental in causing the passage of a law authorizing the corporation of New York to prohibit interments within the city. This law was afterward incorporated into the general statutes of the State of New York. It was not, however, until 1823, soon after the publication of Dr. Felix Pascales' and Dr. Samuel Ackerley's learned and valuable papers on this subject, that an ordinance was passed prohibiting interments within the city limits. This, however, remained inoperative for some time, the rapid growth of that metropolis having created a natural yet lamentable indifference and inattention to a subject of such high sanitary importance. This inattention served to multiply and postpone the remedy of an evil which might easily, and by a little foresight, have been arrested and guarded against.

More attention has been paid to sanitary science by Massachusetts than any other State in this country. The first Board of Health was established February 3, 1797. In 1810 this Board of Health was authorized to make rules and regulations for burial grounds, and for the interment of the dead. All graves for the interment of the dead were required to be at least six feet deep, and lime to be deposited, from June to October, under churches where the dead were interred. In 1850, an ordinance was passed by the city of Boston, which placed the interment of the dead under the care of a registrar; it provided, also, that no grave should be less than three feet deep from the surface of the ground surrounding the grave, to the top of the coffin, and no graves to be dug in any burying ground of the city, excepting at East Boston and South Boston, unless by permission.

Having thus called attention to the origin and history of interments in cities, we shall now proceed to show its injurious influence in a sanitary point of view.

Numerous instances occur in history showing the baneful effects arising from the decomposition of animal and vegetable remains. So important was the burial of the dead regarded, both in a religious and sanitary point of view, by the Athenians, that they capitally punished their generals (although victorious) for neglecting to bury the dead after the battle of Arginusæ, where the Athenians gained a victory over the Lacedemonians, in the twenty-sixth year of the Peloponnesian war, B. C. 406. Aristotle advised Alexander to proceed promptly from Arbela, after the defeat of Darius, to avoid the pestiferous influence of the slain. Lucan speaks of the ravages of an epidemic in the army of Pompey, near Durazzo, caused by the carcases of horses killed and left upon the field of battle; and the camp of Constantine the Great was desolated in consequence of the same imprudence. Diodorus, of Sicily, speaks of pestilences that were caused by the putrefaction of animal substances. St. Augustine makes mention of an extensive plague caused by the decay of animals thrown upon the shore. Paré tells us that in his time the putrefaction of whales thrown upon the beach produced a pestilential fever in Tuscany; also, that, in 1562, an epidemic plague spread for a circuit of ten leagues around Gurenne, owing to the putrid exhalations of a pit filled with dead bodies two months before. Egypt has been ravaged from time immemorial by malignant fevers, owing, no doubt, to the pestiferous miasmata, caused by the decomposition of animal and vegetable remains left by the annual overflowing of the Nile. To this, the uncleanness of the Arabs and Saracens, and the burying of their dead in or near their

habitations, Mead, in his history of the plague, ascribes many of its visitations, and, through commercial intercourse, its spread throughout Europe.\* To the total disregard of all cleanliness and sanitary laws, by the Arabs and Saracens, no doubt in many instances fostered by fanaticism and fatalism, it is credibly asserted that we are indebted for the small-pox, and its subsequent spread throughout the world. France suffered many severe visitations of the plague from the 10th to the 17th century, during times of civil war and famine. The wars of the Swedes occasioned a great pestilence in Poland. Larrey observed similar results from continued conflicts in Austria, in Syria, and in many other countries, but more particularly in Asia. Sennet speaks of fevers breaking out in the armies of the first Napoleon, and in camp, where troops have remained for a long time during the summer. All long sieges, in which much blood is shed, are accompanied or followed by diseases of an epidemic and fatal character. Sebastopol may be mentioned as a striking example.†

Sir James McGregor states :

"That at Cuidad Rodrigo, in Spain, 20,000 bodies were buried in one field, within a period of two or three months. Soon afterwards the emanations from the surface were so offensive and the wells so polluted, that the troops were attacked with malignant and low fevers, and dysenteries, or fevers frequently putting on a dysenteric character."

\* The accounts which we have received from various sources, through the press and legally constituted authorities, in regard to the origin and progress of the visitation of epidemic cholera in Europe, during the year last past, afford a remarkable confirmation of this statement.

† It was the uniform experience of the medical officers of the United States Army, during the late civil war, that the vicinity of battle fields, or any places in a state of siege where great numbers of bodies of men and animals had been buried, were unfavorable to the convalescence of the sick and wounded, and in many instances exciting causes of disease. The localities which had been the scenes of previous contests were afterward found to be exceedingly injurious to the health of the troops who were obliged to occupy the ground or garrison the forts. This was particularly the case with Yorktown, Vicksburg, and Port Hudson.

Mr. Chadwick, who has probably more thoroughly investigated this subject than any other person, and to whom we are indebted for many of the facts contained in this paper, thus sums up the results of his investigations:

"There is no doubt, that the emanations from human remains are of a nature to produce fatal diseases, and to depress the general health of all who are exposed to them, and that interments in the vaults of churches, or in graveyards surrounded by inhabited houses, contribute to the mass of atmospheric and other impurities by which the general health and average duration of life of the inhabitants are diminished."

To understand how such injurious results are caused, it is necessary to examine the chemistry of the putrefactive, and the physiology of the respiratory and circulatory processes, at the same time bearing in mind that the process and rapidity of putrefaction are modified by the nature of the soil, the degree of temperature, and the surrounding agencies. Also, that the remains of the young decompose more rapidly than the old; those of females more than males, and the remains of those dying suddenly when in full health, more rapidly than those who are emaciated by previous disease. Individuals dying from diseases of a malignant character, or where the fluids of the system are in a depraved condition, decompose with still greater rapidity.

When decomposition takes place, the parts become soft; they change in color, exhale a disgusting odor, diminish in weight, and afford several new products, some of which escape in a gaseous form, others pass off in a liquid state, and others are contained in a fatty or earthy residuum. The principal elements of animal matter are carbon, hydrogen, oxygen, nitrogen, sulphur, and phosphorus; these, during life, with a few other elements, are variously combined to form the different

tissues of the animal system. While life remains they are held together in a solid or liquid form; but as soon as life ceases, they separate one from another and form new combinations and escape. The chief products of this putrefaction are water, ammonia, carbureted hydrogen, sulphureted hydrogen, phosphureted hydrogen, and carbonic acid gases, with other volatile emanations, the specific constituents of which have not yet been accurately determined, but which are presumed, and with good reason, to act as ferments, when introduced into the animal system, and are, with but little doubt, exciting causes of epidemic and endemic diseases. These several emanations being gaseous, occupy so much more space than the solid tissues and fluids from which they are evolved by decomposition, that it is impossible that they should remain confined within the narrow limits of the coffin or grave, to which they have been consigned, excepting by the coercion of chemical forces which shall either form new combinations or effect their absorption. Failing to be absorbed or decomposed, they pass into the air and spread infection in whatever direction the winds may waft them. The expansive force is sufficiently great to cause these gases to burst coffins and vaults, and make their way through the porous earth to the surface. Even in soils of clay, they will force openings and escape, though such soils have greater neutralizing and absorptive powers than sandy loams. The extent to which these gases pass through the earth, must depend upon the looseness of its texture, and upon the quantity of putrefying material accumulated within a given space. The lighter products which are not readily absorbed by the soil, such as carbureted hydrogen, phosphureted hydrogen, and other products capable of acting as infectious agents, will rise through the soil, and no depth of burial will, but for a

limited period, prevent their escape into the atmosphere. Those products of decomposition which are either not so volatile and are readily absorbed by water, such as carbonic acid, sulphureted hydrogen, the soluble extracts of flesh, and various other products of the decomposition of animal matter, which are not gaseous, but are soluble, incorporate themselves with and taint the waters percolating through the decomposing mass, and ultimately appear at the surface in the springs or streams which drain the cemetery grounds. Wells, springs, and streams thus become contaminated with the noxious products of putrefaction. It will, therefore, be seen that the results of decomposition are rendered capable of spreading infection, by giving off their noxious effluvia to the air, and through the water that is drunk in the vicinity where it is taking place. The simplest principles of chemistry and natural philosophy teach these facts, and, in the opinion of the writer, cannot be controverted.)

That the emanations of the dead are injurious to health and destructive to life, will be apparent when we reflect that the respiration of sulphureted hydrogen, carbureted hydrogen, phosphureted hydrogen, and carbonic acid and ammoniacal gases, are injurious even to the small and manageable degree to which one is exposed in a chemical laboratory. It is also well known, that of all the circumstances affecting health, none is so important as the condition of the air we breathe. On it, more emphatically than on the food we eat, depends the purity of the blood and the right exercise of every function of the system. Hence the special care manifested for the maintenance of the respiratory process in all animals, alike by the admirable structure of the organs which subserve this purpose, and the beautiful arrangements and adaptations of the media in which they live,

and the circumstances in which they are placed. In a state of nature, all goes on healthfully and well. The same air is not breathed a second time until it has been rendered pure as before; for whenever the air has been brought into close proximity with the blood of living animals, it immediately undergoes a change, which disqualifies it for healthful respiration. One-fifth of the oxygen which it contained—we speak of the function in the human body—disappears, and its place is occupied with a nearly equal volume of carbonic acid. How then can the same portion of air be inspired again without detriment? A fixed amount of oxygen is required at each act of inspiration, to enable the system to get rid of the carbonic acid, which must be discharged every moment, and if not eliminated as nature intended, acts as a slow poison. If we take the ordinary computation of twenty cubic inches of air drawn into the lungs at each inspiration, and of such there are about twenty in a minute, then three hundred and thirty-three cubic feet, or an amount equal to about thirty-three hogsheads, are made use of by each person per diem. Not less than between ten and twelve cubic feet of carbonic acid are therefore evolved in the course of twenty-four hours, a quantity which will be found to contain at least six ounces of solid carbon. The consideration of this fact alone, must suffice to show the great importance of there being no impediment to the due exercise of the respiratory function; and prepares us at once for the pernicious results, that inevitably attend upon the breathing of an atmosphere which does not enable the system to remove its self-generated poison. The retention or inadequate discharge of carbonic acid, besides the more direct effect of the oppression, renders the body more prone to every form of diseased action, and far less capable of resisting the influence of baneful agencies without.

But the change in chemical composition is not the only alteration which the inspired air has undergone. In addition to the large amount of carbonic acid, it has become charged with a watery vapor which renders the atmosphere of unventilated chambers unduly moist, a condition highly favorable to the development of epidemic diseases. The quantity of fluid exhaled from the lungs in health is believed to be at least from sixteen to twenty ounces in twenty-four hours. If the process is imperfectly performed, as must be the case in an atmosphere already loaded with moisture, nature must seek an outlet for this excretion by some other channel. It is not mere aqueous vapor that is thus discharged, but effluvial animal matter is mixed with or dissolved in it, a matter which, upon being condensed, is found to be of a highly putrescent and rapidly decomposable nature; more particularly in cases where the lungs themselves are diseased. It is, in fact, one source of the escape of the excrementitious products of the system, which are being constantly eliminated by the various emunctories of the lungs, skin, liver, bowels, and kidneys, each of these organs having its special task to perform in the great process of excretion and purification so indispensable to the maintenance of healthy life. That the atmosphere of illy-ventilated rooms, where a number of persons are congregated for some time, is tainted with this animal effluvia, is obvious from the peculiar sickening smell perceived on entering a crowded dormitory in the morning, before the door and the windows have been opened; or even a large school-room, where children have been confined for several hours, or the wards of a hospital, particularly when occupied by patients suffering from putrescent diseases, unless there has been, as there should always be, a thorough and continued circulation of pure air. Medical men and others visiting such impure

localities, often retain for several days in their clothes, the offensive smell of such an atmosphere.

The pollution of the atmosphere from the causes now mentioned, as well as the presence of noxious organic matters in it, is probably a more influential cause in generating certain forms of disease, and in powerfully predisposing to the increase of epidemics, than even the vitiation of it from the excess of carbonic acid.

The lungs, however, are absorbing as well as excreting organs ; they are as ready to take in, as to give out. The blood permeates through all the vessels of the lungs with such rapidity that its entire volume has been ascertained to circulate through them in the space of three minutes. Sir B. Brodie says, "the effect of this pulmonary absorption is in some known cases astonishingly rapid and powerful. Life is destroyed by a single inspiration of the concentrated prussic acid, almost as suddenly and effectually as when one is struck down by lightning." How favorable, then, is such an arrangement for the absorption of volatile and infectious matter existing in the inspired air, when we consider the exquisitely delicate fabric of the pulmonary tissue, and the immense surface exposed for imbibition in the tissues of the lungs ; and can we wonder, under these circumstances, at the rapidity of the transmission of infection to every part of the system ? There can surely be no reasonable doubt that, not only are the special morbific poisons generally received into the system in this way, but that the gaseous products of animal and vegetable decomposition, and the effluvia given off from living bodies, for the most part enter the circulation through the lungs. These emanations rapidly produce their deleterious effects through the circulatory system, to a degree greater or less, according to the receptive condition of the individual, as modified by tempera-

ment, age, and vigor of constitution. The general effect of the absorption of such morbific matter is to lower, in a very marked degree, the physical energies of the system and act as exciting causes of diarrhoea, and other diseases of the bowels, a proneness to fever and inflammation of a low grade, and, as might be expected, a peculiar liability to *all epidemics*.\*

It has been ascertained that the healthful performance of the function of respiration cannot be maintained in a space of less than from 700 to 800 cubic feet, in enclosed apartments with fair facilities for ventilation, and that, during the prevalence of an epidemic or contagious disease, even a greater amount of space is necessary. The writer believes that air deprived of its normal proportion of ozone, by the frequent respirations of the inmates of hospital wards, or by the exhalations emitted by wounds in a bad condition, or from other lesions, especially those of a putrescent character, is less effective to carry on the chemical changes absolutely essential to the healthful performance of all the functions of the animal system; and furthermore, it is his opinion that a less bulk of air highly ozonized is sufficient to fulfill all the requirements of the respiratory process, than of an equal bulk of air containing less ozone; the former being in an active and the latter in a passive condition.†

\* General Vardy, who was charged with the duty of burying the bodies of those who fell on a battle-field near Nuremberg, and not wishing to quit the scene of conflict until he had accomplished the duty assigned him, was seized, as well as several officers who accompanied him, with violent vomiting and persistent diarrhea. The day after the interment several horses died with all the symptoms of septic poisoning.—*Arch. Gen. de Med.*, January, 1863.

† May not the increased activity of the ozonized oxygen in the air at certain times, account for the prevalence of inflammatory diseases, such as pneumonia, pleuritis, rheumatism, etc.—its deficiency for the prevalence of diseases of a low type, such as typhus, malignant erysipelas, cholera, etc.? If so, it has been suggested by Prof. Blaney to the writer, whether it might not be possible to modify these diseases by increasing or diminishing the amount of ozonized oxygen in the air, supplied for the respiration of the sick, affected by the one or the other of these opposite types of disease, since chemistry has recently furnished us the means by which these conditions may be effected.

The effluvia which result from the decomposition of human remains, not only affect the living body through the atmosphere, by interfering with the pulmonary functions, but there is another effect of such emanations, through their contact with the cutaneous surface. Chemically, we produce fermentation in certain vegetable matters or compounds by the presence of, or mixture with, other materials or compounds that have already gone through a similar process. Pathologically, the contagious diseases, such as small-pox, scarlatina, and measles, or the infectious diseases, such as typhus fever, cholera, yellow fever, and diphteria, when epidemic, are generated by the presence of, or contact with, the emanations from others, who are or have been in like manner diseased. So, by the same law, emanations or effluvia from dead bodies, or the exhalations and exudations of living but diseased bodies, may excite in the fluids of the system fermentative action, resulting in functional derangement or organic lesion.

Dr. Lyon Playfair states :

" Both decaying and putrefying matters are capable of communicating their own state of putrefaction or of decay to any organic matter with which they come in contact. To take the simplest case — a piece of decayed wood, a decaying orange, or a piece of tainted flesh, is capable of causing decay or putrefaction in another piece of wood, orange, or flesh. In a similar manner, the gases evolved from sewers, occasion the putrescence of meat or vegetables hung in the vicinity of the place from which they escape. But this communication of putrefaction is not confined to dead matter. When tainted meat or putrescent blood-puddings are taken as food, a disease analogous to rot ensues, and generally terminates fatally.

" The decay or putrefaction communicated by putrid gases, or by decaying matters, does not always assume one form, but varies according to the organs to which their peculiar state is imparted. If communicated to the blood it might possibly happen that fever may arise ; if to the intestines, dysentery or diarrhoea might result ; and I think it might be a question worthy of consideration, whether consumption and all diseases where there is a depraved condition of the system

may not arise from such exposure. Certainly it seems to be so among cattle. The men who are employed in cleaning out drains are very liable to attacks of dysentery and diarrhoea. The effects produced by decaying emanations will vary according to the state of putrefaction or decay in which these emanations are, as well as according to their intensity and concentration."

There is no doubt in the minds of medical men, that these emanations are prejudicial to the health and strength of the living, and that dead matter, in any stage of putrefaction, is noxious to life. They are but too familiar with the poisonous character of wounds received in dissections and post-mortem examinations, to leave any doubt upon this to them familiar subject.

When these gases are diluted by diffusion through the air, they are less noxious than when more concentrated, but even in this condition they are injurious, as all gases are that diminish the ozonized condition of the atmosphere. Sensitive persons have often been known to faint or fall into a swoon from the inhalation of cadaverous exhalations while passing burying-grounds. Generally speaking, the feeble suffer more from this exposure than the stout and robust. Individuals who are predisposed to any derangement are liable to have this return when exposed to such emanations. In the "Report of the Health of Towns Commission," the following is stated as having occurred in a certain locality in England: "A family had returns of head-aches and sore throats, to which they were predisposed every time the wind blew the exhalations of a crowded church-yard, which was near by." The sick are made worse, particularly those affected with certain forms of disease. "The Hospital St. Louis, in Paris, was at one time subjected to the influence of putrid exhalations; particularly when the wind blew in a certain direction, it was observed that the wounds and sores assumed a foul

aspect. Hospital gangrene also manifested itself there under the same circumstances.” \*

Wells are frequently contaminated, and, in many instances, the use of water from them had to be discontinued. Prof. Brande states “that he has frequently found the well waters of London contaminated by organic matters and ammoniacal salts.” Mr. Post states, “that he had a pump, the water of the well attached to which had been very good, and used for domestic purposes, but that since a burying-ground was formed above his house, the water in his well had become of so disagreeable a flavor as to prevent its being used as heretofore.” Laws exist in France prohibiting the opening of wells within 327 feet of any place of burial, and in some of the German States, wells are forbidden to be dug within 981 feet.

Cellars in the vicinity of cemeteries are frequently infected with these gaseous and fluid emanations, so much so that it is dangerous to enter them. Dr. Reiche, of Stuttgart, states, that—

“In 1777, in a cemetery which yearly received from 2,000 to 3,000 corpses, they dug an immense common grave. This was fifty feet deep, and made to receive from 1,500 to 1,600 bodies. In February, 1780, the whole of the cellars in the streets near by were no longer fit for use. Candles were extinguished by the air in these cellars; and those who approached the openings into them were immediately seized with alarming attacks.”

Many other instances might be enumerated of a similar character.

\* In all military hospitals, during the late war of the rebellion, it was found that the emanations arising from the wounded affected with erysipelas, sloughing stumps, or hospital gangrene, and in all cases where putrefactive fermentation of the tissues had occurred, though combated by the most approved disinfectants and absorbents, would spread from bed to bed through the wards, rendering the isolation of such patients the only effective means of preventing the spread of infection; it was also found, from the greater freedom of ventilation and removal of effluvia, that the patients recovered much more rapidly in hospital tents than in crowded apartments.

Sewers have also been found to be more offensive when they pass through cemeteries.

It will be seen from the foregoing that the common opinion that depth of burial will protect the living from the miasmatic products of decomposition, and that the earth entirely destroys the noxious qualities of whatever is deposited in it, is erroneous. Some of the earths decompose or combine with a portion of these noxious emanations, but the recent detritus of rocks, alluvium, sand and gravel, have no such chemical affinity for them, nor considerable power to neutralize their poisonous nature. In some cases the presence of these gases is made known by their offensive odor, but generally speaking, they are so much diluted by the air as not to produce specific diseases upon persons in good health, but simply a depression of vitality and a diminished ability to resist attacks of disease, in those who live within their influence.

Time seems to offer no security against the presence or deleterious influence of these gases. Instances have occurred where they have been retained in coffins for years, which, upon being opened, sent forth their noxious effluvia, seriously affecting those who were engaged in opening them. When the revolutionary mob of Paris broke into the vaults where the kings had been buried, and opened the coffins for the sake of plunder, they were overpowered and sickened by the gas that issued from the coffin of Francis I, who died in 1557, and had, therefore, been buried almost two and a half centuries. Old burial grounds that had not been used for many years, have been found to give off offensive effluvia, when the soil was disturbed.

During a series of experiments made at and near Burlington, Iowa, in 1851-2, for the purpose of determining the relation which ozone held to certain epidemic

diseases, the writer could not usually detect its presence where any considerable amount of animal and vegetable matter was undergoing rapid decomposition. It was not until the weather became very cold that he could detect its presence within the cemetery enclosure, or in the immediate vicinity of slaughter or packing houses. He could not detect its presence in occupied unventilated apartments, or in the river bottom on the Illinois shore, excepting at points where the ozonometers were exposed to the west and north-west winds, or in localities where there was a strong current of air; and it was not until after severe frosts that he could detect its presence elsewhere on the low lands of the vicinity, and not until the thermometer had fallen and remained below the freezing point was it found everywhere in the swamps. In the same proportion as the presence of ozone was found everywhere, certain types of disease diminished; also, the evidence of the existence of ozone increased in the atmosphere, as the ozonometers were elevated above the earth, and it existed more abundantly, at the same elevation, in the winter, than in the summer months. In his opinion this is due to the diminished amount of animal and vegetable decomposition in the colder months, the products of which in the warm months are constantly neutralizing the ozone, from whatever cause it may be produced; also, that the less amount of moisture which the air contains at temperatures below the freezing point, and the freezing of the soil, permit, in consequence of the reduced conductive power of both, a greater difference between the electrical condition of the earth and of the atmosphere, a condition highly favorable, as generally recognized, to the production of ozone. He is also satisfied, from his own observations, that ozone exists more abundantly in the atmosphere, other conditions being the same, after, than before a thunder

storm, and that, proportionally to the amount of electrical disturbance during the storm. To its absence may be attributed the oppression experienced by every one previous to the occurrence, and the feeling of relief after the passage of a storm, making all allowance for the difference of barometric pressure. During the prevalence of the cholera at Burlington, in 1850, the weather was very oppressive and hot, and on the 16th of July there was a thunder storm, accompanied by a fall of about half an inch of rain. The epidemic abated immediately, and but one fatal case occurred that day, the number of new cases diminished, and, as it was emphatically expressed by a gentleman in conversation with the writer, in referring to the circumstance, "we all once more dared to breathe."

From these observations, in proof of which the writer can furnish abundant data, there is no room for doubt that ozone is a purifier of the atmosphere, and that anything, no matter what, which diminishes the normal amount of ozone acts injuriously upon man and animals.\*

Reasoning, therefore, from a purely chemical, physiological, and philosophical stand-point, we are fully warranted in making the assertion that the emanations of human remains frequently result in disease, increase the ravages of epidemics, in many instances act as exciting causes of them, and diminish life. And as corrob-

\* While discussing this subject with Prof. J. V. Z. Blaney, of this city, he called the attention of the writer to the connection which must undoubtedly exist between the increase of ozone in the atmosphere and the disturbances of the magnetic needle, termed magnetic storms, which are so carefully noted in our own and foreign observatories. A series of comparative experiments, made with delicate ozonometers and accurate magnetic needles, such as are in use in national observatories, would, in his opinion, give results which would contribute much to our present knowledge of the atmospheric conditions which precede and accompany endemic and epidemic diseases.

It is certainly a matter worthy of investigation, which it is to be hoped some one who has the opportunity will pursue.

orative of this, we call attention to the following well authenticated facts.

Raulin (*Observ. de Med.*) relates, that the opening of a corpse at Leictourne occasioned a grievous epidemic on the plain of Armagnac. At Riorm, in Auvergne, they were removing the earth about an old burying-ground which they intended to arrange for the embellishment of the city. Soon after, an epidemic disease carried off many, particularly of the lower classes, living in the neighborhood of the cemetery. At Aubert Haller, a church became infected from a single corpse, after twelve years interment, in consequence of which all the members of a convent were attacked with a dangerous malady.

The attention of Dr. Haguenot, professor in the University of Montpelier, was called to the dangers of inhumation in his city, by the following incident: On the 17th day of August, 1764, the body of a layman was conveyed to a vault in the parish of Notre Dame. While lowering the corpse, a man first went down to support the coffin, and fell senseless; another followed, to assist him, and, though drawn out in time, was afflicted with severe illness; the third was drawn up immediately; a fourth dared the danger, and died, as soon as he had entered the vault; the fifth came out once to recover strength, and, returning the second time, staggered from the ladder and fell dead. The bodies at last were drawn up with hooks. In the neighborhood of the church where the above calamity took place, the small-pox broke out and raged with great violence. Dr. H. made many experiments, showing its influence in causing fatal or epidemic diseases.

Dr. Maret, of Dijon, in a book published in 1773, states, that —

"A catarrhal affection, or influenza, existed in Saulien, a populous town of Burgundy. Two persons who died with it, were buried beside each other in graves dug under the pavement of the parish church, within an interval of twenty-three days. The coffin of the first accidentally broke, and a quantity of putrid fluid was effused which in an instant filled the whole building with a stench intolerable to the bystanders, and out of 170 persons, 140 were seized with putrid malignant fever, which assumed the character of an epidemic differing only in intensity and fatality."

In a report on the Yellow Fever of 1838-39, as it occurred at Charleston, it was attributed to domestic origin, owing to the decomposition of animal and vegetable matter. The same report recommended burying the dead beyond the precincts of the city.

Dr. Blair, in his report of Epidemic Yellow Fever, as it occurred in British Guiana, in 1852-53, says :

"The poisonous agent persisted in its predilection for damp, low, crowded places, and the neighborhood of putrid exhalations, and woe to the unwary or reckless who lived or lingered in such places, or were exposed to such exhalations."

From the "Report of the Sanitary Commission on the Epidemic Yellow Fever of 1853, published by authority of the City Council of New Orleans, by Dr. E. H. Barton, 1854," we collate the following important facts : In looking over the sanitary map accompanying this report we find that the Fourth District suffered most severely, in fact, more than double that of any other district, the mortality being at the rate of 452 per 1,000 of the population. In this district exist three extensive cemeteries, in which were buried last year nearly three thousand bodies. It was in one of these, that the offensive exposure of bodies occurred, so painful to the public. In the first ward of this district was a series of low, crowded, and filthy pest-houses, inhabited by the lowest class of people. The proportion of

deaths here was 542 per 1,000. The next in mortality was the Third, containing all the cemeteries and most of the vacheries. The proportion here was 508 per 1,000.

The First District comes next, the ratio to the whole population was 234 to the 1,000. The second worst ward in this district is the Seventh, in which are the *Girod-Street Cemetery*, two extensive hospitals, and the gas works. The number of fatal cases in it was 394 per 1,000.

In the Second District, we have 87 cases per 1,000. *Ward No. 2*, bounded by Canal, Rampart, and St. Louis streets, and the Swamp, having more than double the amount of the average of the district, or 173 per 1,000, embraces in its limits *all the cemeteries of the district* (of four squares), in which were buried that year 1,163 bodies, also *the open and half-stagnant Clairborne and Canal street drains*, and *the filthy conduits in the rear*, *the receptacle of a large portion of the foul and corrupting materials of the upper part of the city and vicinity*, and *the influence of the swamps and open drains beyond*.

The Third District shows 114 fatal cases to the 1,000. In speaking of the causes of the mortality in this district, much of it is attributed to *the polluting air of a cemetery*, in which were buried during the year 2,446 bodies.

Dr. Barton adds :

" There is probably no climate in America where the vicinage of cemeteries would and does do so much damage to public health as here. Rapid and prolonged decay results from the great moisture of the climate, and comparatively small desicative power. Burying almost universally above ground (in the cemeteries of the city), the mortar connecting the brick-work soon splits, giving exit to injurious exhalations from the within decompositions. The force of the gases (and especially under the augmented temperature of the summer, when they are most injurious,) is often so very great as sometimes to burst the leaden coffins (when made of it), and always to escape through the pores of the wooden ones, and to split the metal-

lic ones, and the brick and plastered work of the vaults, contaminating the atmosphere for a great distance around. In no case, then, if permitted in cities, should a dwelling be permitted nearer to these yards than several hundred paces, according to the frequency of interment. The period in which the body is undergoing decomposition, varies according to the age and size, the season, and the more or less compactness of the tomb. The sextons inform me, that from three to six months is an average period. Let it be longer or shorter, the process is constantly taking place, and any visitor to the graveyards can easily satisfy himself that the confinement of the decomposing bodies is too imperfect for the safety of the community."

The entire Commission unite in the recommendation that "The present cemeteries within the city limits should by all means be closed against future use." \*

\* The writer having been on duty at New Orleans, and in the Department of the Gulf, during the late civil war, from December, 1862, to February, 1864, had ample opportunity to investigate the climate, topography, and character of the diseases of that region. He made frequent visits to the cemeteries and localities spoken of in the report of Dr. Barton, and is only astonished that attention had not earlier been called to them. The dead of our army were buried about four miles out of the city. No where in the history of medical science is found a more striking proof of the beneficial results following the strict enforcement of quarantine, and sanitary police. When we consider that there was accumulated in this city and its vicinity a large force, composed of Northern men totally unacclimated, therefore more liable, as experience has abundantly proved, to attacks of the diseases incident to the locality, and, from their vocation, more exposed to atmospheric changes and malarious influences, than natives or those who by long residence had lost their susceptibility to these diseases, the improved general health and diminished mortality become still more remarkable. Such results must be accepted as indubitable proof of the soundness and efficacy of the principles of modern hygiene, when enforced by Military authority.

The yellow fever had, as a general rule, appeared in New Orleans in certain months of the year, and frequently in a severe epidemic form, previous to its blockade and occupancy by the United States forces, and no cases have occurred there since, with the exception of a few that were brought there on the gun-boats and vessels belonging to the blockading squadron of the Gulf, whose crews were allowed to pass the quarantine station without being detained, when it became necessary that they should refit or obtain supplies. These facts prove that yellow fever is not indigenous to this locality, and that its access may be prevented by the enforcement, by competent authority, of a strict code of quarantine regulations; also, that the observance of a most stringent sanitary police of that city and its vicinity has, and may again ward off the approach of the pestilence which has for so many years proved fatal to a large proportion of strangers, and at times more than decimated its population; that quarantine regulations may prevent the incursion of diseases foreign to a district, but the internal police regulations and observance of hygienic laws

Dr. Bryant, in a paper on the Yellow Fever as it prevailed at Norfolk and Portsmouth in 1855, published in the "American Journal of Medical Sciences," April, 1856, says:

"That nearly all the interments were made in the city, and that the soil was sandy and in some places loamy, and if you dig six feet you come to water. Burial for the dead was obtained with difficulty, as there were scarcely any houses in which some were not dead."

*Forty-five per cent. of the population died.* After making several sanitary suggestions with a view to prevent a recurrence of scenes through which they had just passed, he uses the following language:

"The last, and, at the same time, one of the most important of these suggestions relates to the remains of the sacred dead. They can scarcely be said to rest beneath the sod. They lie in tiers; and some of them, from the sad necessity of the case, uncoffined; while but thin strata of sabulous earth separate them from the water below and the superincumbent air. The average depth of the graves is about four feet, the deepest five, and in many of them three bodies are placed, one upon the other. When the summer's sun shall pour its fervid rays down upon this decaying mass, can it be otherwise than that their noxious gases will commingle with the pure air, and sooner or later aid in reproducing other harvests of disease and death?"

"Again, in two cities having a combined population of 27,000 people, many domestic animals must die annually whose bodies are hastily and carelessly disposed of; enough, certainly, to add a very

by the residents can alone prevent the ravages of diseases peculiar to any given locality. In cities and districts unoccupied by Military, the responsibility falls necessarily upon, and should be met by the Civil authorities. The enforcement by Civil, being less easily accomplished than by Military authority, greater stringency in the construction of ordinances should be observed, and these more strictly enforced, under circumstances which forbode the approach of epidemics of a malignant character, and still more on the actual occurrence of such epidemics within any city or district. Municipal or Corporate authorities may properly assume, and should be supported by community, in the stringent enforcement of hygienic rules, which under ordinary circumstances would be considered oppressive, both as regards expenditures and police regulations. In some respects, there is a striking similarity in the topography of Chicago and New Orleans, and it is to be hoped that the lesson learned will not be lost upon this city. It requires no prophet to interpret it: the "handwriting is upon the wall."

sensible proportion to the many other sources of deleterious air. I am aware that it is affirmed by some, that animal decomposing matter is not deleterious. This is far from being established by sufficient facts. The remedy here indicated is the disinterment of the dead, and their removal to a distance of not less than eight miles from either city, and the total forbidding of intramural or even suburban cemeteries."

Speaking of this and other measures, he says :

" These form the principal works whose accomplishment is absolutely necessary to the future healthfulness and well-being of Norfolk and Portsmouth, and if they or their equivalents are not accomplished, it is unquestionable that sporadic, and, at intervals, epidemic yellow fever will continue to repeat its ravages, and heap its hecatombs of human victims upon those it has already slain."

Dr. Milroy, in his Report on Cholera, in 1845-1846, in Persia and India, says :

" That at Kurachee, near the mouth of the Indus, in a few days, 8,000 were carried off by it. It commenced on the 14th of June. Men attending the burial of their comrades, were attacked, carried to the hospital, and themselves buried the next morning. Pits were dug in the church-yard, morning and evening; sewn up in their bedding and coffinless, the dead were laid side by side, and one service read over all. In the next five days, it raged with appalling fury; it then abated in its intensity, but continued to hover around the place for another week. What must have been the scene of desolation, and the sickening pollution of the air after such a visitation, when nearly 9,000 bodies were festering under the ground beneath a tropical sun."

Jameson, in his description of the Cholera in the camp of the Marquis of Hastings, on the banks of the Scinde, in 1846, says :

" Here, 9,000 were carried off in the course of one week, the disease rapidly subsiding upon the withdrawal of the troops from the locality."

Mr. Kellie, in his Report on Cholera in India in 1849, says :

"The disease commits its greatest ravages in crowded, ill-ventilated barracks, bazaars, densely populated towns—particularly such as are surrounded by walls, preventing ingress of pure air, and in that portion of them where noxious gases are evolved by the *decomposition of animal and vegetable remains.*"

Dr. Roe, in the London "Medical Times," speaking of Cholera in 1849, says:

"On the night of July 9th, the great outbreak in Stonehouse Lane took place, and between that time and the 17th, there were sixty-four deaths in a circle the diameter of which did not exceed eighty yards. The inhabitants of this place were chiefly Irish, of the lowest and most degraded class, herding together like cattle, ragged, half-naked and inconceivably filthy: dead to all proper feeling; even the scenes around them made no good impression, for they stole the spirits and everything they could lay their hands on, even the blankets from off the dying. Situate as they were, in small, close, and over-crowded rooms, it was impossible to afford them the assistance necessary, and the difficulty was increased by the *determination of the living to retain the dead, sometimes until long after decomposition had been established,* for the sad but noisy obsequies of their country. The dead and the dying lay together in one small room which was in so horrible a condition that, when the bodies were removed, the only way it could be cleaned was by introducing the hose of a fire-engine through the windows, and washing all down stairs."

Dr. Shank (Hay's Medical Journal) relates the case of a man who died of cholera in California, in 1850, and who was buried with his cloak around him. The natives exhumed the body, for the purpose of getting the cloak, and six of them died of cholera.

During the prevalence of the cholera at Burlington, Iowa, in July, 1850, a number of the dead were interred in the city cemetery. No deaths occurred in the neighborhood of the cemetery, until about twenty had been buried there; after this, until the epidemic ceased, cases occurred, and always in the direction from the cemetery in which the wind blew. This fact first called the writer's

attention to the danger of burial in the vicinage of the living. . The cemetery was removed two years afterward.

Many other facts of a similar character might be enumerated, but the foregoing are sufficient to prove conclusively the truth of the chemical, physiological and pathological deductions arrived at in the consideration of this subject. They show that the same laws hold good in all the important epidemic visitations, no matter in what quarter of the globe, and under what circumstances they have appeared.

In reviewing the various epidemics that have reaped their harvests of death at different periods of the world's history, we cannot but be impressed with their periodicity, or as it may be termed, their cycloid character; this has been particularly the case with cholera. These occurring in frequency and intensity in the same proportion as the laws of health are violated, and diminish in like manner as they are observed. Whenever there is a disturbance of any of the laws of nature, there is a consequent reaction in an opposite direction until the equilibrium or harmony is restored. There is no doubt but that the awful visitations of the plague, which at intervals for so long a period desolated the Eastern continent, were the result of a violation of the laws of hygiene, and we believe such is also the case with cholera, or, in a word, of all epidemics.

In conclusion of this part of our subject, we would call attention to the following extract from a report made to the British Houses of Parliament, in 1843:

" From replies to queries issued by the General Board of Health, it appears that the number of private and public burial grounds at the present time in the metropolis is 138, but this cannot be taken as the actual number, since a great many parishes have not yet sent in their returns. The total number cannot be less than 200, and is probably somewhat more. There are then in London, situate at various distances from each other and each differing in extent, 200

centres of more or less pollution, each pouring off unceasingly, day and night, its respective contribution of decaying matter, but the whole together, reckoning only the gases from decomposing human remains, amounting, as we have seen, in one year, to be upwards of two million and a half of cubic feet. Whatever portion of these gases is not absorbed by the earth—earth already surcharged with accumulation of centuries—and whatever part does not mix with and contaminate the water, must be emitted into the atmosphere, bearing with them, as we know, putrescent matter perceptible to sense. That these emanations do act injuriously on the health of the people resident in the immediate neighborhood of the places from which they issue, appears to us, by the evidence that has been adduced, to be indubitably established. From the law of the diffusion of gases, they must be rapidly spread through the whole atmosphere that surrounds the metropolis; and though they thereby become diluted, and are thus rendered proportionally innocuous, yet that they do materially contribute to the contamination of the air breathed by two millions of the people, cannot, we think, admit of any reasonable doubt. We submit, therefore, that a case is made out for the total prohibition of interment in the metropolis, on account of the injury resulting from the practice, to the public health."

This was not enough. No decisive action was taken by Parliament until after the appearance of the cholera in 1849, and the publication of a "Report on a General Scheme of Extramural Sepulture, by the General Board of Health," presented to both Houses of Parliament, by command of Her Majesty, in 1850. From this report we extract the following:

"Noxious gases are continually emitted which are both themselves injurious to health, and also afford a medium for the transmission of pestilential agents. In the vicinity of some of these church-yards, it has been stated that severe complaints almost invariably prove fatal; and the evidence adduced by the Board of Health sufficiently proves, that this pestilential atmosphere formed *a fit nidus for the poison of cholera during the last fatal summer*. Into these graveyards, 220 acres, 50,000 bodies are annually conveyed. From the decomposition of these bodies, it has been calculated that 2,572,580 cubic feet of gas, deleterious to health, are given off, and the greater part of this is exhaled into the atmosphere. During the last thirty years

there have been interred, in 318 cemeteries, 1,500,000 bodies, and in the next thirty years, if the same state of things is allowed to continue, to this decaying mass there will be added a number of bodies equal about to the whole population now living in this great city. Consequently it is to be feared that the influence of the gases given off from the putrefying bodies, may take a wider range, and more deadly; and whereas now there is no doubt that a large amount of sickness and many deaths are attributable to these exhalations, in another generation the poisonous miasmata may breed a pestilence, and cause a terrible mortality.

"But the exhalations into the atmosphere are not the only evils; the fluid portions of the decomposing body pass into the earth, drain into sewers, emitting from untrapped gulley holes offensive odors, or transude into wells, contaminating drinking water, and probably causing in this, some ill-conditioned diseases."

The establishment of rural cemeteries, both in Europe and in this country, accessible to cities, has in a great measure broken up the custom of intramural interments, and that such is not the case in all, may be attributed to imperfect knowledge of scientific and sanitary laws; the tenacity with which communities hold to funeral customs; and the natural feeling of indisposition to the removal of the remains of the sacred dead, by their relatives or friends. The advantages of rural cemeteries are daily becoming more appreciated as society becomes more enlightened in regard to the laws of health, and more refined in its tastes. They are located out of the busy crowds of cities, in the stillness and quiet of the country, amid the beauties of natural scenery, where "man may go to his long home and sleep undisturbed forever." There is a peculiar fitness in the selection of such places for sepulture, as a final resting place for the dead. There is a feeling of sanctity and repose connected with such localities, which cannot but harmonize with the feelings of friends and relatives, when they visit the spot where all that remains of their loved ones is deposited, in strong contrast with the noise

and bustle inseparable from large cities. From the sanitary stand-point, a still stronger fitness may be seen, when we consider that the abundant vegetation, though cultivated for ornamentation of the cemetery, subserves the additional purpose, together with the growth of the surrounding country, of consuming and appropriating for its own growth the deleterious gases which would otherwise be detrimental to animal life. This mode of restoration of the atmosphere to its original purity by vegetation, is sufficient evidence that an All-wise Providence has foreseen man's necessities, and provided a remedy, fully illustrating the aphorism, that

"God made the country, and man made the town."

Among the first rural cemeteries established in Europe, and the most distinguished for their beauty, are, "Pere la Chaise," "Vaugirard," "Montmartre," and the famous "Campo Santo" at Pisa. Through their influence and example others were founded in Europe, and in the lapse of time, and as the result of the same causes, "Mount Auburn" was established, in 1831, "Laurel Hill" next, "Greenwood," in 1842, and soon after, "Forest Lawn," "Mount Hope," "Cypress Hills, "Evergreens," and "Spring Grove."\* The appearance and attention paid these resting places of the dead—God's Acre (Gottesacker), or the Court of Peace (Friedhof), as the Germans beautifully call them--may be regarded as a sure evidence of the culture, refinement, and enlightenment of the community in which they are situated.

Rural cemeteries are attractive places; here communion is held with nature, through the trees, with their overarching branches shutting out the noonday sun, the shrubbery, the flowers, the mantling ivy, and the sweet

\* Chicago, too, has its "Rose Hill," "Graceland," and "Oak Woods"

songsters of the air which make it vocal with their warblings. The plats of flowers, the trained shrubbery, the neatly-cut turf, and serpentine walks—all afford scope for the exercise of taste. Here, too, sculpture can exercise her art, from the simplest device of a plucked rose-bud, or of a broken shaft, up to the colossal statue of departed greatness. In the slumberous silence that pervades these Cities of the Dead, far different feelings are awakened from those suggested by the busy turmoil of the living. The uncertainty of life, the vanity of human pursuits—wealth, power, ambition, conquest—for which we toil and struggle, all are forcibly impressed upon the contemplative mind. No one can visit a cemetery without becoming “a wiser and a better man;”—without realizing in their full force the lines of Gray—

“Can storied urn or animated bust  
Back to its mansion call the fleeting breath?  
Can Honour’s voice provoke the silent dust,  
Or Flattery soothe the dull cold ear of Death?

“The boast of heraldry, the pomp of power,  
And all that beauty, all that wealth, e’er gave,  
Await alike th’ inevitable hour,  
The paths of glory lead but to the grave.”

In the establishment of cemeteries, there are a number of important considerations which demand attention; among them are the location and topography of the ground, the proximity of the living, the nature of the soil, the arrangement and depth of graves, and the ornamental embellishments; all of which directly or indirectly have their bearing upon the health of the living. It should be an elevated site, that the gases resulting from decomposition may more readily be diffused through the mass of the atmosphere, and, thus diluted, have less effect upon the health of communities; and on

the leeward side of a town in respect to the prevailing winds, particularly during hot weather, when decomposition is most rapid, so that the effluvia may be carried away from the inhabitants. They should also be at a distance of not less than from 100 to 250 yards from any habitation, according to the prospective number of persons to be interred, and the farther removed from the dense population of towns and cities the better, care being also taken, if located on high ground, that the wells and springs, at lower grades, be not contaminated by the drainage of the cemetery.

Another important consideration is the character of the soil, as decomposition takes place more rapidly in some than in others. Affection would select the soil most unfavorable to decomposition, as there is a natural and common desire that the bodies of friends should retain their form, and their faces the expression of life as long as possible, while in a sanitary point of view, those are best that are most favorable to decomposition. Clayey, loamy, ferruginous, and aluminous soils, peaty and boggy earths, are unfavorable to decomposition ; while sandy, marly and calcareous soils are favorable to it. Clay soil is to a considerable degree antiseptic, owing in part to its absorptive powers and its tenacious and compact texture, by which the gases that are evolved are retained, the air is excluded, and the rapid percolation of water prevented much longer than in any other kind of soil. Being thus retained, the permanent gases acquire by accumulation a degree of pressure which at last enables them to force their way to the surface and diffuse themselves through the atmosphere, though the percolating currents which feed the springs and wells are not so liable to be contaminated as in looser earths. The reverse is the case with sandy, calcareous, or otherwise porous soils, which permit the freer

transmission of water falling upon the surface, and hence by filtration through the decomposing mass, corrupt the water to greater distances. Proportionally as the results of decomposition are removed by this filtration, is diminished the exhalations which escape into the air as fast as they are evolved from the putrefaction, thus mingling gradually with the atmosphere, without being so dangerous. Constant submersion in water at a low temperature retards decomposition.

It will therefore be seen that a loose porous soil is the best in a sanitary point of view, in which to bury the dead, as it facilitates the transmission gradually of the gases outward, and prevents their accumulation.

The depth of the grave is also a matter of great importance with reference to the protection of the living. If too deep, decomposition is delayed; if not deep enough, it will occur too rapidly, when considered in a sanitary point of view; in either case, the result may be injurious. So important has this subject been considered, that in many countries laws exist prescribing the depth of graves. In France, from four feet ten inches to six feet two inches; in Munich, six feet seven inches; Frankfort, five feet seven inches. At Stuttgart, depth for bodies of persons under eight years, four feet; eight to ten years, four feet seven inches; ten to fifteen years, five feet, and upward, six feet. In this country, graves are generally dug from four to six feet, and should be modified by the circumstances of age, sex, disease, season of the year, and character of soil. In a hygienic point of view, only one body should be placed in a grave, and care should also be taken not to dig graves too near each other.

In conclusion, the writer proposes to make an application of the principles enunciated in the foregoing paper—which, as has been shown, are well established by science and experience—to interments in the cemeteries located in this city. These, when established, were sufficiently removed from the centres of population, being from a mile and a half to two miles from the business part of the city, and for the number of interments made at that time, and no doubt did not contemplate that in a few years their immediate vicinity, and even still further north, would be densely populated. From the topography and character of the ground, it will be found that at the highest points, and those very limited, no grave can be dug at a greater depth than five feet the greater part of the year, and in point of fact, few or none are dug deeper than four feet without coming to water, and many still less, particularly in what is called the public part of the City cemetery. The same is the case with the Catholic cemetery; three-fourths of the bodies interred in these cemeteries were deposited in water accumulated there between the time of the digging of the grave and the depositing of the bodies in them. Nine-tenths of the soil is sand, with the exception of the sloughy or swampy parts of these grounds, where peat and alluvium are found intermixed. Owing to this sabulous or sandy nature of the soil, the exhalations from decomposing bodies, and more especially from the shallowness of the graves, must in hot weather be greatly facilitated; while on the other hand the passage under ground of gases and decayed particles of animal matter by percolation, must be greatly assisted by the influence of copious rains; also from the properties of a sabulous soil, it is impossible that the noxious emissions from the dead should be to any extent absorbed or neutralized by its

action. A very marked feature in the topography of these grounds is a series of ridges, with intervening sloughs which, running parallel with the Lake, extend southerly through the Catholic cemetery, and there receiving the drainage of both cemeteries, find a common outlet on the lake-shore less than half a mile north of the Chicago Water Works. The surface drainage of the upper part of the cemetery empties into the Lake through a small stream. The drainage into the Lake from every portion of these cemeteries will be appreciated from their proximity to it, and from the topography of the ground, and the sandy nature of the soil, resting as it does upon a stratum of clay impervious to water, so that when it rains the water percolates through the sand and the decomposing mass of animal matter until it comes to the clay, whence it is carried directly into the Lake.\*

When the fact is borne in mind, which fully appeared in evidence during the late trial of the case of *Bates vs. The Illinois Central Railroad Company*, before the District Court of the United States, that a southerly current is constantly flowing along the lake-shore from north to south, in all directions of the wind, thus sweeping whatever noxious discharges may come from these cemeteries to the very source of the universal supply of water for the use of all the families of the city in every division,—the liability thus caused to a disastrous influence upon the health of its population assumes a grave

\* The sextons inform the writer that a stratum of clay is found about eleven inches in depth, extending over three-fourths of the ground owned by lot-holders, embracing that portion of the cemetery between Clark street, and the first ridge or elevation east of it, (in which graves can be dug at all times of sufficient depth), at from two and a half to three feet below the surface. The ground here is flat, and the natural drainage bad; therefore when a grave is dug, the greater portion of the year, through this stratum, the water that is in the sand above it, drains into the cavity below, and soon fills it up on a level with the clay. The graves sunk below the upper stratum of clay thus serve as a means of drainage to their immediate vicinity.

and serious importance.\* The danger under ordinary circumstances may not be appreciable; yet, on the occurrence of any fatal epidemic, which would multiply to an indefinite degree the interments in the cemeteries, and that too, at the hot season, when decomposition is most rapid, the evil might assume an alarming form, communicating its baneful effects not alone to those who live in the immediate vicinity of the poisonous exhalations, but through the water to the entire city. Even the probability of a result so disastrous, should claim the early attention of an enlightened and intelligent community.

Thus we wrote over six years ago; since which time the population of this city has increased by the addition of over seventy thousand, and in the immediate vicinity

\* The writer, fearing that this statement was too general, has examined with much care the reports of Cols. Graham, Raynolds, and Cram, U. S. Engineer Corps, and E. S. Chesbrough, Esq., City Engineer, on the obstructions to navigation at the mouth of Chicago river, which have a direct bearing on the question under consideration, and finds that in the main it is correct, with perhaps the exception at rare intervals, when a powerful south-east wind is blowing. The tendency of accretions is downward, as is proven by the sand bars that have from time to time formed at the entrance to the Chicago harbor, the accumulations by deposit above and below this point, by the diminution of the shore line of the lake, and more particularly at the extreme southern limit of the lake, where the deposit of accretions is very marked, both as regards the shore line, and the depth of water. There is no doubt that the depth and width of the lake south of this point, at one time was much greater than it is now, as the writer is informed by Col. Foster, that he has traced the original shore line of the lake some distance to the south-west, and for more than fifty miles to the south and south-east of its present line, plainly showing that this process has been going on for ages. The direction of the waters flowing out of Chicago river, is southward, rendering the entrance to the harbor difficult, and circuitous, thus interfering with navigation. To obviate this, channels have been cut through the bar, and unless repeated dredgings are resorted to, they soon fill up, and the waters of the river form a new channel southward, plainly indicating the direction of this current. The east and north-east winds have the effect of increasing this current, striking the lake shore in such a manner, from its conformation north of this place, as to stir up the sand (which is there found abundantly) and carry it south. The milky appearance of the water, when the wind blows from this direction, also proves this, as the clay banks from whence this appearance is derived, are found some distance north of Chicago. The physical geography of Lake Michigan, also confirms the fact of this southerly current along its western shore.

of these cemeteries over one hundred per cent., with an increase of business equally great, and in some departments in excess of this proportion. In the same ratio, also, has the drainage and the offal and refuse-matter of a large portion of the city emptying into the Chicago river been increased. Owing to the sluggishness of this stream, the exhalations at certain times during the summer months are very offensive, and unless great care is exercised, injurious results will follow from exposure to them. The importance of this subject is undoubtedly appreciated, as means are in progress for securing better drainage, but as these will not be available the coming season, it is a matter of vital import to relieve this outlet as much as possible, by preventing the throwing into the river, either directly or indirectly through the medium of the sewers, any substances that can otherwise be disposed of.

In like manner, as a necessary consequence, the mortality has increased, and although ordinances were passed from time to time by the authorities, providing for interment elsewhere, and forbidding interment in the public part of the City cemetery, still the records show an increase of burials, almost equal in proportion to the increase in population, though interments were made in Rose Hill and Grace-land cemeteries, during this time. On an examination of the register kept at the City cemetery since June 24th, 1861, it appears that 9,541 bodies were buried in it, from that time to March 1st, 1866; and as near as can be ascertained about 1800 were buried from January, 1860, to the time from which the register dates. How many have been buried in the Catholic cemetery, the writer could not learn with any accuracy, but is satisfied that the number buried in both cemeteries from January, 1860, to the present time, amounts to

about 12,000. This number was swelled by the burial of 3,871 prisoners of war in the City cemetery, which commenced in the latter part of 1862, and continued until July, 1865. These were brought from Camp Douglas, a distance of nearly six miles, and carried through the very heart of the city, and deposited in a soil already surcharged with decaying animal matter, and, as has already been shown, totally unfit, by its character and locality, for such a purpose. The writer is at a loss how to account for such an extraordinary procedure, and the indifference manifested in regard to it. Why it was permitted, is beyond his comprehension. It may well be challenged whether such an instance of flagrant violation of the laws of health has been anywhere perpetrated within so recent a date in any civilized community. Where was the Health Officer? If his reports were regularly and properly made, the municipal authorities must have been cognizant of these facts, and should be held with him equally responsible for any deleterious results that have or may follow to community.

After careful investigation, we learn that the putrefactive process occupies in the Chicago City cemetery, and in the old Catholic cemetery, from five to fifteen years, depending upon the character of the ground, the season of the year, the age, sex, disease, the tightness of the coffin and the material of which it is composed, and the character of the clothing in which the dead are enveloped. At this rate, from the records of interment for the last fifteen years in these cemeteries, there must be at least from 18,000 to 20,000 bodies undergoing decomposition at this time, the same conditions having existed, and in nearly the same proportion, for some time.

For the last five years the impurity of the lake water

by which this city is supplied, has at times attracted much attention. Complaints have been increasing in about the same ratio that the population of the city has increased. So serious has the condition of the supply of water become, that on the 17th of March, 1864, the "Lake Tunnel" was commenced, and is now more than half completed, to extend about two miles under the Lake, to a point where it is supposed this great essential to healthful life can in all its purity be obtained. This undertaking, of the successful completion of which we have no doubt, must prove of the highest importance in a hygienic point of view to this city, and will undoubtedly be one of the greatest practical triumphs of engineering skill on record. We challenge the citation of another instance in which has been displayed an equal amount of energy and enterprise in a community of the same age and population. The impurity of the water above referred to is attributed to various causes, the chief, being the sewage of the Chicago river, emptying as it does about three-fourths of a mile below the Water Works, and "other impurities from the lake shore." That the discharge from the Chicago river contributes at times a large portion of these impurities is undoubtedly true. This, however, is only the case when there is a strong wind blowing from the south-east, and then only to a depth of about seven feet below the average surface of the Lake. We have already shown that there are currents in Lake Michigan trending southerly, and that if the waters of the Chicago river are allowed to seek their natural outlet, they will move in the same direction after their entrance into the lake. The north pier, extending for some distance into the Lake at the entrance of Chicago harbor, prevents these discharges of the river from flowing northward, except under

very extraordinary circumstances. By the "other impurities" referred to, are undoubtedly meant such substances as are directly thrown into the Lake. The writer has been of the opinion for the last seven years, that at least a portion of these impurities may be positively traced to the Cemeteries that border and lie immediately on the lake shore for nearly a mile. When it is borne in mind that in these cemeteries 20,000 bodies are undergoing the putrefactive process at this time, and that the same has been the case for the last five years; that three-fourths of these bodies are deposited in a narrow strip of ground, known as the "public grounds" of these cemeteries, where the depth of burial is so shallow that the winds frequently expose to view the coffins in which the dead are enclosed;\* and that the drainage into the Lake, consequent upon the topography and character of the soil, is peculiarly favorable for carrying these noxious compounds directly into it, thence to be carried south by the lake current to the source from whence the supply of water is obtained; we feel fully warranted in the above assertion. After careful investigation, we make bold to assert that the cemeteries are the most constant and general sources of the pollution of the water supplied for the use of the city, and that this pollution is increased when, by the prevalence of south-easterly winds, a portion of the waters of Chicago river are deflected northerly, and make in this way a contribution of the sewage of the city.

In order to appreciate this subject in all its bearings, the writer would call attention to the existence of a species of tide or of ebb and flow in the lake, from whatever cause it may be produced, as often as once in every

\* The writer is informed by the sextons, that they make it a business to go around the cemetery to cover up the coffins that have been unsanded by the wind several times a year.

ten minutes, which is constantly perceptible, even in the calmest summer day. The regularity of this rise and fall of the Lake was discovered by the late Col. J. D. Graham, U. S. A., while on duty here, engaged in a series of observations with reference to the improvement of the harbor.\* The height of the Lake has been daily gauged for a number of years under the direction of the Sewerage Department of this city, and from a report made to the Board of Public Works by W. H. Clarke, Esq., Assistant City Engineer, we extract the following table, giving a statement of the highest, lowest, and average levels attained by the Lake during this time. The levels are so many feet above or below standard low water, as adopted by the Sewerage Commission :

YEARS.	Highest level reached by the Lake during the year.	Lowest level to which the Lake fell during the year.	Average level of the Lake during the year.
1855.....	3.45	0.15	1.56
1856.....	3.05	0.42	1.60
1857.....	4.35	0.60	2.42
1858.....	4.69	1.33	2.90
1859.....	4.45	1.31	2.98
1860.....	3.53	1.30	2.54
1861.....	4.40	0.90	2.56
1862.....	3.30	1.20	2.50
1863.....	3.30	0.70	2.10
1864.....	2.80	-0.80	1.57

It will be observed that the lake was, during this period, when at its greatest height, 5.49 feet higher than when at its lowest level. The greatest fluctuation in one year was 3.75 feet.†

\* The same was observed by Prof. I. A. Lapham, at Milwaukee, anterior to the time of its discovery by Col. Graham, but without his knowledge.

The early Jesuit missionaries noticed this ebbing and flowing of the waters of the lake, La Hontan at this point, and Charlevoix at Green Bay.—*Foster & Whitney's Geolog. Report Lake Superior.*

† From observations made on Lake Erie since the year 1796, an extreme though transient change of level is known, amounting to seven feet, and a secular or permanent change of five feet. On Lake Michigan an extreme fluctuation of six feet has been observed. On Lake Superior the greatest known range of level is three feet, with indi-

From another table in the Report of the Board of Public Works for the year ending March 31, 1865, we condense the following for certain months of the year, from April, 1855, to November, 1864, inclusive, when the putrefactive process is most rapid:

Months.	Maximum.	Minimum.	Mean.
April.....	2.796	1.536	2.127
May.....	3.112	1.842	2.258
June.....	3.133	2.023	2.593
July.....	3.215	2.282	2.775
August.....	3.198	2.149	2.700
September.....	3.374	1.851	2.536
October....	3.136	1.824	2.371
November....	3.061	1.300	2.129

From the foregoing it will be seen that the average rise and fall of the Lake which is constantly taking place, is about three feet (at times, more); to this add the effect of the wind, which Mr. Clarke informs the writer averages one foot, (of course at times much more), and we have as a maximum four feet of elevation above the average level. Taking these facts into consideration, also, that the cemetery grounds vary in height above low water mark from eight to sixteen feet, and the sandy character of the soil, we cannot but come to the conclusion that this rise and fall acts as a constant drain upon these grounds, carrying whatever may be contained in them directly into the Lake.\*

With all these facts, can it be wondered at that complaints are made of the character of the water, when the rains filter through such a vast mass of cor-

cations of a much greater range. Lake Ontario has a variation of four feet nine inches, well determined by water registers since 1812.—*Col. Whittlesey, Elev. Lakes above Ocean.*

\* This fact will be more fully appreciated by persons who have witnessed the rapid disappearance of the water through the sand on the beach, as each breaker washes over it, showing its great absorptive power by capillary attraction.

rupting animal matter, carrying with it the offensive and deadly results of the decomposing process into the common reservoir from which the water is taken?\*

Since this paper commenced going through the press, the writer has noticed that at a meeting of the Board of Police Commissioners, who by virtue of their office control the Health Department of this city, held on Friday, March 9th, an appropriation was made for the furnishing of the Pest House, (Lake Hospital), and the purchasing of such articles and medicines as were necessary, with a view, *in addition to its present use*, to convert it into a cholera hospital the coming summer. This hospital is located on the south-eastern part of the City cemetery grounds, and north-east of the Old Catholic cemetery, and within a short distance from where thousands of bodies are undergoing decomposition. It is built upon sand, surrounded by a fence about ten feet high, with scarcely a blade of grass within the enclosure, and within a short distance from habitations. In order to reach this from every portion of the city, patients would have to be carried through a principal thoroughfare, Clark street, and in many instances they would have to be transported for miles. In their transit they would spread infection wherever they went, as it is a well settled fact that if not contagious, the

\* The fish during a part of the winter season, are the source of great annoyance, by being drawn in by the pumps and forced into the water-pipes, obstructing the flow of water, and from the debris left by being killed in their passage through the pipes. May not the presence of these in such immense numbers be attributed in a great measure to the large quantity of putrescent organic matter contained in the water, in the vicinity of the inlet by which the water is obliged to pass from the lake to the pumps? We are led to the suggestion of this opinion, by the well known fact that fish are attracted to the places where their food is most abundant, and from considerable distances, more by the sense of smell than by any other sense, as they generally prefer putrescent materials for food. The sense of smell is more acute in them than any other sense. They are, in fact, the scavengers of the water.

cholera is nevertheless transmissible through the medium of the atmosphere.

The obstructions to the communication between the different divisions of the city, by the opening of the bridges crossing the Chicago river, to permit the passage of vessels, and the arrest frequently and for a considerable time of large numbers of persons, both foot passengers and those in vehicles, must increase the danger of infection, which would spread from patients in the act of transit from the several divisions of the city to this remote hospital. Another serious objection to carrying them so far is, that cholera is exceedingly rapid in its course, and no doubt the transportation of patients to so great a distance would result fatally to many who otherwise might recover; it being a well recognized fact that absolute rest is one of the most important indications in the treatment of this disease.

We have thus spoken as if the disease already existed in the city. Experience has taught that its origin is foreign to this locality, and that we are to look for its approach from the Atlantic sea-board, strictly following the lines of communication, and appearing sooner and with the greatest virulence, in the largest communities upon these routes. The lines of approach from that direction, enter the city in its southern part, from two to three miles from the Pest House. Cholera, not having yet made its appearance, we will presume that a case is brought here by one of the Eastern trains, (the hour for the irarrival being, generally, early in the morning or late at night, a time when this disease is most infectious), and in order to reach the Pest House it must be carried through the city. It would result that the very means that have been taken for the care of the unfortunate individual, and the protection of the city, might and probably would be the means

of spreading the disease and causing it to become epidemic.\* The patient once there, (if he survive the transit), would, in addition to the local contamination of the atmosphere, have to inhale the pestiferous exhalations of the Chicago river, and of almost the entire city, as at the time when decomposition of both animal and vegetable matter is most rapid—the months of June, July and August—and cholera commits its greatest ravages, the wind blows generally from the south-west, as is evidenced by the meteorological tables, and personal

\* "Dr. Barth, one of the physicians of the Hotel Dieu, who had charge of the cholera patients in that institution, has recently delivered a lecture founded upon observations made during the epidemic of cholera in Paris. He believes that three former attacks of cholera which have visited Paris, can be traced to the Ganges as their starting point; but that the last epidemic evidently took its origin from the pilgrims at Mecca. He is of the opinion that the disease is propagated by means of germs in the atmosphere, having their origin in noxious emanations, and that they are borne by currents of the air from place to place, and are conveyed from point to point on shipboard. A person has no surety against a second or even a third seizure. Among the most marked predisposing causes, he mentions a high temperature; living in low, damp regions; eating improper food, especially fruit; depression of health and spirits, such as follows, for instance, an attack of typhoid, typhus, and rheumatic fever.

"According to the opinions of M. Zagrill, a physician in Cairo (Egypt), the poison of cholera is conveyed in minute particles by the wind. This is why it often passes over certain villages without attacking them; the molecules, when propelled by a violent storm are retained at a certain distance from the ground, in exactly the same manner as locusts, which, carried by the wind, traverse certain localities without committing the slightest ravages. This, in the writer's opinion, is also the reason why the epidemic first makes its appearance in the night; at that time the wind abates, and the molecules are deposited."—*Lancet*, Nov. 25, 1865.

At Burlington, Iowa, we noticed that the mortality and frequency of attacks was greatest when the wind blew from the south-east, bringing with it the malarious exhalations of the Illinois swamps, on the opposite side of the Mississippi river. Also that this effect was most marked in the night, or early in the morning, and in such localities and at such an elevation, where, from the results, the poison must have lodged or accumulated during the night. In order to appreciate this fact fully, it is necessary to understand the topography of that city. A portion of it is situated in a basin about fifteen feet above the level of the river, with bluffs gradually rising to one hundred and fifty feet. From the situation of these bluffs, they receive the full benefit of the south-east wind, or, as it might be termed, embrace it, and its effects were manifest by the increase of cases that occurred at the lower edge of the bluffs, diminishing in frequency as the residences were elevated, and but few occurred on the summit. The infection seems to have been carried beyond that portion directly fronting the river (although cases occurred there also), back to the edge of the bluffs, the elevation above the river being nearly the same.

experience. Under such circumstances few would recover, and those who did, would incur the risk of contracting small-pox, and might finally die of that loathsome disease. The germs of disease exist in and about this Pest House, and the locality already is a fit nidus for the spread of the infection. Once there, cholera would spread from this nucleus in all directions. In some respects no better place could have been selected to propagate the disease. Interments would necessarily take place, and these as a consequence would be made in the cemetery, thus adding to the poisoned condition of the air, and diminishing the already slim chances for life of the unfortunate victim. Anything that depresses the system, whether of a mental or physical character, not only acts as a predisposing or exciting cause of cholera, but also contributes to its intensity and probable fatality. It will therefore be perceived that all the surroundings of this hospital are unfavorable to the recovery of patients sent there.

The greatest of all desiderata for patients, attendants, and community at large, are, pure atmosphere exterior to, and free ventilation of the interior of the structure provided for their accommodation, and, as far as possible, isolation of the infected. How and to what extent do these conditions obtain in the hospital prepared to be used for the reception and treatment of patients affected with cholera, by the Health Department of this city? We have nothing to add to the proof already furnished in the preceding portion of this paper. Science and experience teach these facts, and why not profit by them? Humanity compels us to protest against the use of this pestiferous place for such a purpose. These considerations are of vital importance, and do not alone concern those who live in the immediate vicinity, but also the entire pop-

ulation of the city. The location of the Pest House at this place is in direct violation of sanitary laws, an outrage upon the neighborhood, and an act of inhumanity to those who may be so unfortunate as to be sent there.

We would suggest, as a substitute for the plan proposed, the organization of cholera hospitals, upon the same principles as those of the "general field hospitals," which, during the war of the rebellion, were found so efficient in the treatment of the sick and wounded. Instead of wooden or brick structures, we would recommend the use of the regulation hospital tents, any number of which could be readily arranged, in any given locality, and at such times as they might be required. By means of a thorough understanding between the City Authorities and the Railroad Officials, the trains might be quarantined, especially the immigrant trains, with but little detention or inconvenience to passengers. All those found affected with any symptoms of the disease, could be thus prevented from entering the city, and be immediately provided for, under circumstances much more favorable to their recovery than if arriving as strangers in a strange city at hotels, or detained in depots, uncared and unprovided for, and finally carried per force for several miles to places provided for their reception.

The first hospital camp erected should be as near as circumstances would permit to the crossings of the several railways approaching the city from the East and South; and should the approach of the disease from any other direction be threatened, smaller establishments could in a few hours be erected, at a proper distance from the city, on the line of communication.

Should the cholera break out in the city, the writer would recommend the location of similar hospitals

in whichever division and whenever it might appear. A few hours only would be necessary to accomplish it, the appliances having been previously provided. The selection of the localities should be carefully made, and the several hospitals placed under the management of medical men, who, in addition to previous experience, should possess a high degree of medical attainment, combined with executive ability.

There can be no doubt, by this or a similar mode, the details being dictated by the exigencies of the occasion, its access to the city might be retarded if not prevented; and if, after all proper precautions, it should appear within the limits of the city, its intensity and fatality would be diminished, its occurrence confined to more limited localities, and, in brief, the disease rendered more manageable, many lives saved, and much suffering prevented, with comparatively little expenditure. In addition to its importance from a humanitarian or sanitary stand-point, every one must perceive, that should the plan proposed be adopted, of the success of which under proper management there can be no doubt, the increased confidence inspired in the traveling public, by such action on the part of our authorities, could not but materially contribute to the commercial interests and general prosperity of our city.

Various attempts have been made from time to time, by citizens, to prevent interments within the Corporate limits. In the fall of 1858 a petition was presented to the Common Council signed by a number of the most prominent and influential citizens of the North Division, remonstrating against further interment in the cemetery under the control of the city. On November 8th, 1858, a report was made on the petition, recommending that the prayer of the petitioners be granted, and the appointment of a Special Committee to take into

consideration the removal of the present cemetery grounds to new locations, and to report to the Council as soon as possible. This report was concurred in and the Committee appointed, who, on the 14th of February, 1859, reported, recommending the adoption of an ordinance directing the Mayor, Comptroller, and City Clerk, to confer with the managers of the Rose Hill Cemetery with reference to the interment of those whom the city should be obliged to bury, and directing that the sale of burial lots in the City cemetery should cease from and after May 1st, 1859. This order was passed by the Common Council March 20th, 1859.

On the 15th day of February, 1860, an agreement was entered into between the City of Chicago and the Rose Hill Cemetery Company, by which the said Company agreed "to set apart and appropriate a section of the cemetery grounds of said Company, as a burial place for such bodies as said City of Chicago, by its proper officers, might direct to be there interred," and such others as might be desired by the City authorities to be interred in the same section of the cemetery at rates agreed upon.\*

From some inexplicable cause, this agreement has never been carried out, though the Cemetery Company has retained a section of its ground separate from other sections, subject to the demand of the City authorities in accordance with their agreement.

Notwithstanding this agreement, interments in the public grounds of the City cemetery continued as before. Public attention having again been called to this fact, an ordinance was passed October 24th, 1864, by the Common Council, forbidding interments in the Chicago cemetery, except in lots which had been sold

\* A similar arrangement has been made with other cemeteries.

by the city. Burials continued as usual ; the ordinance remained a dead letter until September 4th, 1865, when a resolution was introduced and passed by the Common Council, directing that the provisions of the ordinance of October 21st, 1864, be carried out. Since then, we believe with but few exceptions, no interments have been made there, save in lots owned by individuals, for which the thanks of the community are due the present Common Council, although they did no more than their duty.

Interments in the public part of the Catholic cemetery have been discontinued for some time by order of the Bishop, although they are still made in private lots.

By a recent decision of the Supreme Court of Illinois, the title to about twelve acres of land of the "Old City cemetery" has been declared to be in the heirs of Jacob Milliman, deceased. In consequence of this decision, an ordinance was introduced and passed by the Common Council January 22nd, 1866, making the necessary provisions to vacate the tract, rather than repurchase it on the terms asked by the heirs of said Milliman. This action was judicious, both in an economical and sanitary point of view, and is an evidence upon the part of the Authorities that they are alive to the importance of the trust confided to their keeping by their fellow-citizens.

From the foregoing, it will be seen with what pertinacity the burial of the dead has been continued within the Corporate limits, and in direct violation of prohibitory ordinances. Evasions are daily taking place by parties, who, though legally exempt from these prohibitions, violate their spirit and intent, to the obvious detriment of the health and lives of the residents of the vicinity. There is a moral turpitude in such conduct, in view of the probable approach of a malig-

nant epidemic, which should arouse the indignation of all.\* There now remain over two thousand lots, exclusive of the "Milliman Tract," in which interments are made without violating the ordinances of the Corporate authorities. The patients who died of small pox, have been buried in the public part of the Chicago City cemetery, at an average depth of from three to four feet, owing to the fact that the graves cannot be dug deeper on account of the water.

If, as has been proposed, the so-called Lake Hospital, heretofore known as the Pest House, is to be used for the accommodation of patients suffering from cholera, should we be so unfortunate as to have a visitation of that epidemic, those dying in that institution would, as those now dying there, be buried in the City cemetery, and undoubtedly from the emergency arising from the necessity of speedy interment, many other bodies would be deposited in the public grounds, unless prompt and stringent measures are adopted by the Board of Health, and their execution vigorously enforced. All such interments would be additional to those who would under the present ordinances be legally entitled to burial there in lots owned by themselves or relatives, within the cemetery, and the probable results need not be here repeated.

We, therefore, do not hesitate strongly to urge the necessity of prohibiting absolutely, and under heavy penalties, all further interments within the Corporate limits of the city, and we predict that should this not

\* From an article published in the "Chicago Republican," of March 12th, 1866, on "The Health Department," and evidently published by authority, we extract the following, referring to the duties of "City Undertaker." He "is required to bury all deceased patients from the Lake Hospital, unless the remains are taken in charge by friends. Formerly ground was provided by the city, but by action of the Authorities this has been relinquished, and the undertaker is now required to locate the ground at his own expense."

be accomplished, the mortality will be greatly increased in the event of cholera becoming epidemic.

The fact that the Lake Tunnel will not be finished so as to furnish pure water until next September, and that the project for the drainage of the Chicago river and the removal of the sewage which flows into it will not be accomplished during three years, makes this the more imperative. There is no time for delay. Let immediate steps be taken to prevent all future interments within the Corporate limits, and as soon as practicable let arrangements be made for the gradual removal, at proper times and seasons,\* of the remains of those already interred, with the ultimate view of converting these grounds into a public park, which shall contribute to the health, pleasure, and credit of our city. For years to come the soil, now saturated with noxious emanations, is only fit to be used for such a purpose, or the cultivation of vegetable growths which shall absorb and render innocuous those gases which, if emitted into the air, would be otherwise injurious. The sooner this is accomplished the better, both in an economical and sanitary point of view, while at the same time, less violence would be done to the feelings of the friends of the deceased whose remains are there deposited, than if further accumulations should be permitted. It is inevitable that, sooner or later, the growth of the city, as well as public sentiment, will demand and enforce the complete vacation of the present City cemetery. The history of all large cities, both on this continent and in Europe, sufficiently proves this assertion.

The writer would again call the attention of the individuals interested and the Authorities to the following extract from a decree made by the French

\* No removals should be made from May to November, and this year none from the 1st of April.

Government in 1774, as being peculiarly applicable to existing circumstances in this city at the present time :

" We know, however, that this decree is against the wishes of a certain class, who found their claims upon a possession, in itself an abuse, or upon a permission acquired by means of a small sum, which, they imagine, entails an hereditary right; *as if possession were a right superior to justice, or that a prescriptive indulgence should be continued, in despite of its injury to the public good; or that a certain sum of money was equivalent for the health and life of their fellow-citizens.* But these objections are of little moment, and must yield to the considerations of the public weal; and, no doubt, these very individuals, if they can cast aside their erroneous prejudices and prepossessions, and look only to the advantage of their fellow-citizens, will join with the majority in applauding this decree. It is, moreover, *an acceptable service in those entrusted with the power of watching over the welfare of their fellow citizens, to extend their solicitude to the preservation of the public health, by using the most efficacious means for removing the cause of disease.* This object alone, independent of any other, would have been sufficient to determine this court to institute this decree."

We have thus somewhat at length traced the origin and history of intramural interments, and proved, from chemical, physiological and pathological stand-points, the evil effects of the practice upon the health of the living. We have shown that this custom is universally condemned by the highest medical authorities of both Europe and America, and that in most countries and states the civil authorities have broken it up, and compelled the burial of the dead far from the limits of cities and populous towns, and at a depth beneath the surface sufficient to prevent the contamination of the air. Here in the midst of what is now a rapidly growing section of the city, with a great public thoroughfare bounding it on one side, and with dwelling-houses surrounding it on three sides, we have a tract of land to which thousands of bodies are annually consigned in shallow graves, and in a loose soil which permits the

escape of the gases that are evolved into the surrounding air which we breathe, and the soluble organic matters to be carried into the waters of the Lake which we drink. If this practice is permitted to continue much longer, this city of the dead will be more populous than that of the living. It is true that the ordinances prohibit public burial, but there is nothing to prevent the purchase of lots by the undertaker, and of their appropriation to miscellaneous burial. Let any one who is skeptical on this point visit the cemetery, and he will see graves "thick as the leaves that strow the vale of Valambrosa," graves almost in contact, without a hillock thrown up, and a mere slab of wood to mark the spot, with the initials or numbers of the occupant rudely marked thereon. Thousands of rebel prisoners were consigned to this common receptacle, in violation of a public ordinance, and yet no cognizance was taken of it. Such a state of things cannot continue long. Let the Authorities act, and act promptly and efficiently, in anticipation of a public sentiment which will soon compel them. Why defer action now which must soon be taken, even should we escape a visitation from the threatened pestilence?\*

\* Just as the last sheets are going to press, we have information by telegraph that the cholera has made its appearance at Key West, Florida.

From a revised copy of the Proceedings of the Police Commissioners, at a meeting held March 27th, we extract the following, by way of explanation:

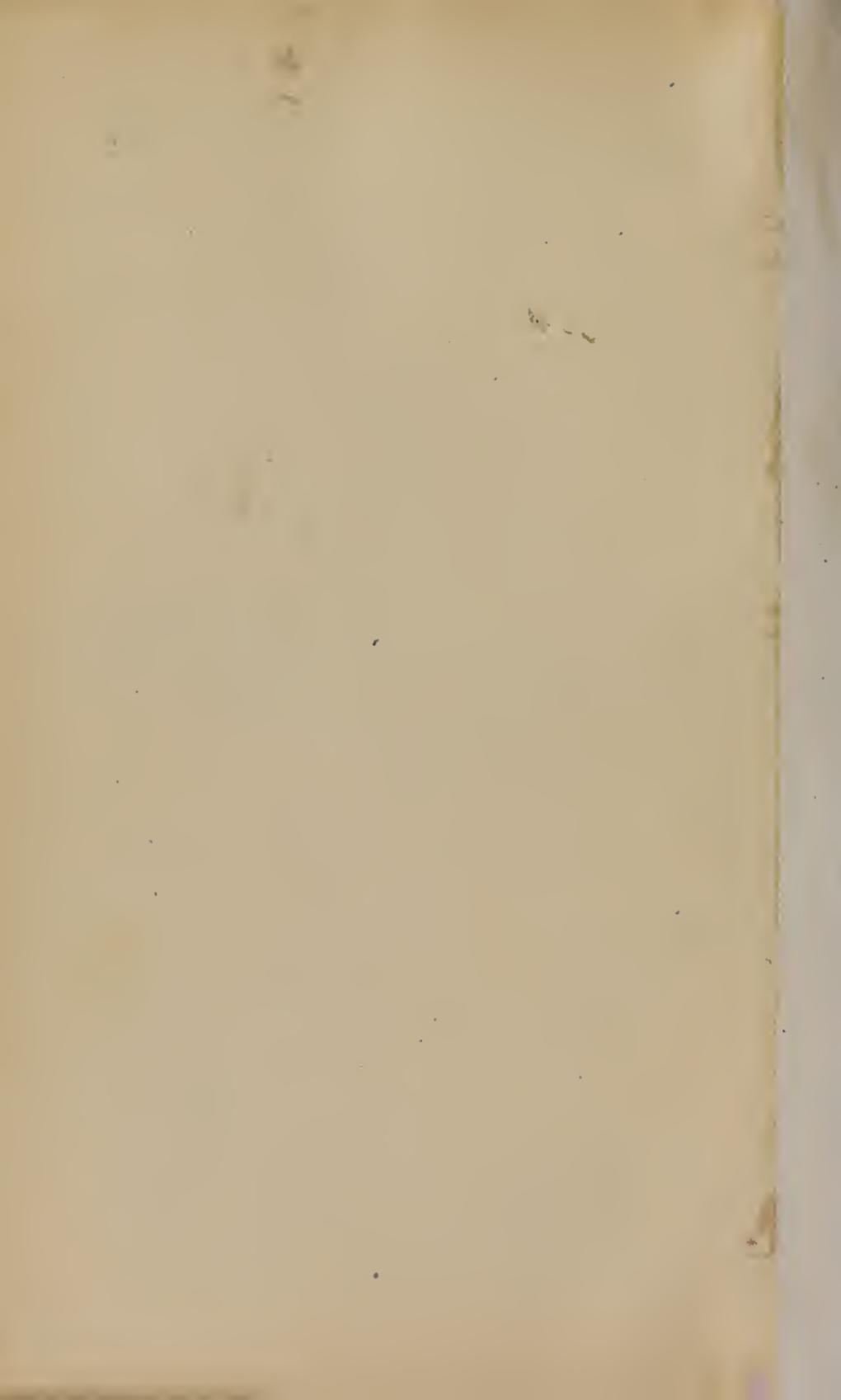
#### THE CHOLERA.

Dr. Blake, the City Physician, desired to make a statement in regard to a pamphlet of Dr. John H. Rauch, on the subject of intramural interments, making certain statements in relation to the pest-house, and the plan of the Board of Police Commissioners, in regard to the apprehended visitation of cholera. The informal conversation of a few weeks before had been reported, and Dr. Rauch had acted on that. The pamphlet had been condensed and published in the daily papers. Owing to reports published in the papers he misunderstood their plans—they had adopted none, but merely discussed the question. Dr. Rauch had assumed that, in accordance with their plan, the pest-house was to be the only hospital. It was not so. It was proposed to have one at Camp Douglas, and one on the West Side. The hospital is one of the best small pox hospitals in the United States. Patients convalesced rapidly, which would not be the case if such pestiferous exhalations, etc., as those mentioned by Dr. Rauch, existed.

As far as quarantining was concerned, he did not consider it advisable at this time, so far as an inland city was concerned. He had consulted with many physicians, and when the time came he would submit their views to the Board in the form of a recommendation.

He thought the pamphlet placed them in a false position—in an attitude of having adopted an imperfect plan.

The President agreed with Dr. Blake, that Dr. Rauch had an erroneous impression in relation to the action of the Board.



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